S AMERICA VULNERABLE TO AIR ATTACK?

POPULAR AVIATION

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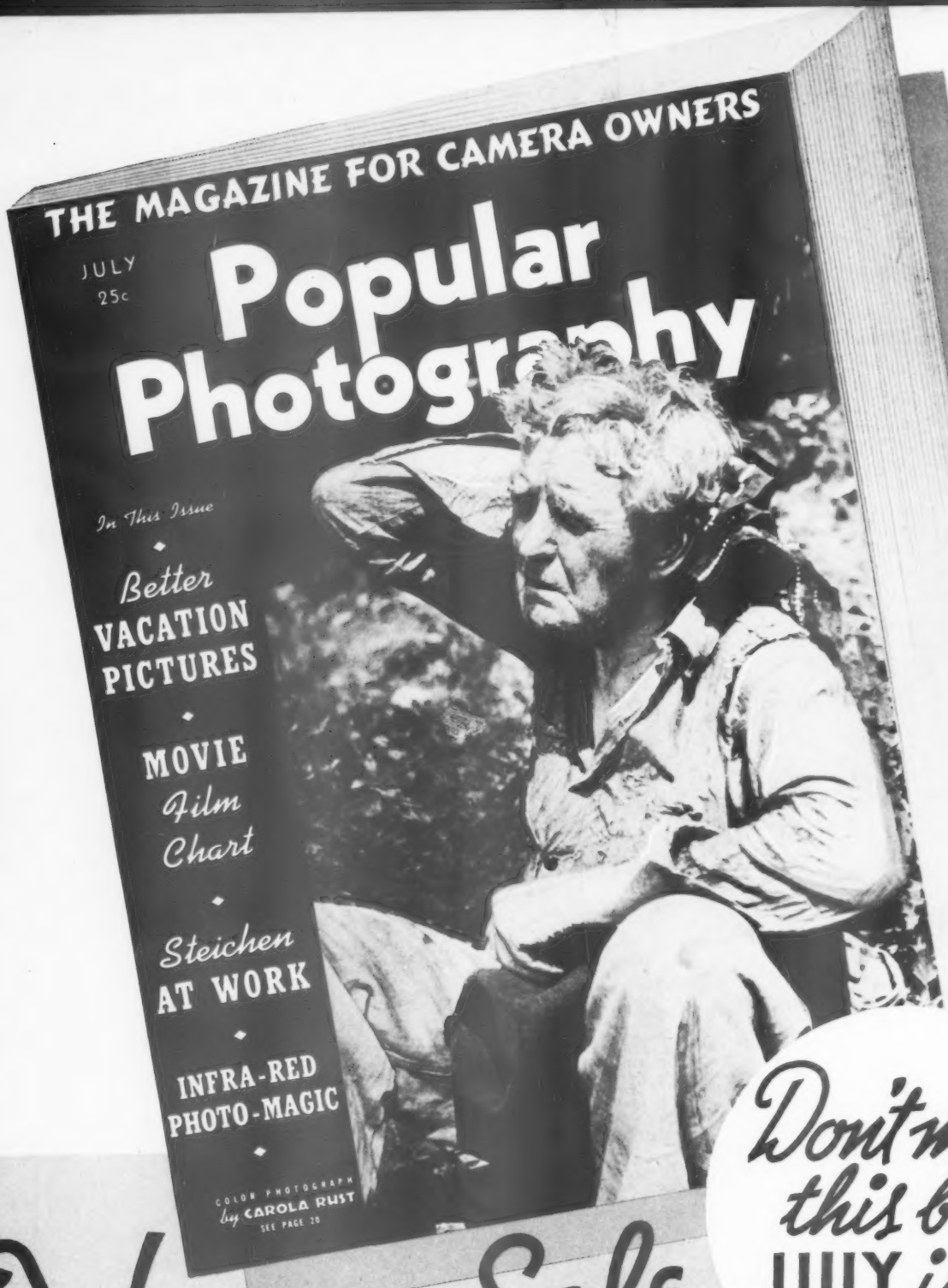
"MEN WITH WINGS"
SEE PAGE 10

HOSE FLYING TURKS • WHY THEY JUMP

AJOR-
ENERAL FECHET ON "ANTI-AIRCRAFT"



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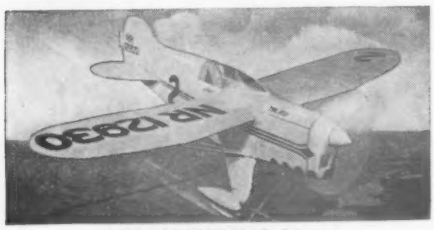

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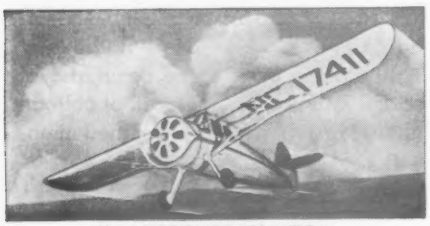

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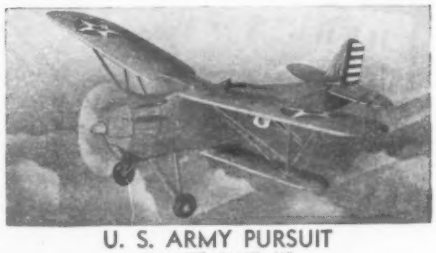

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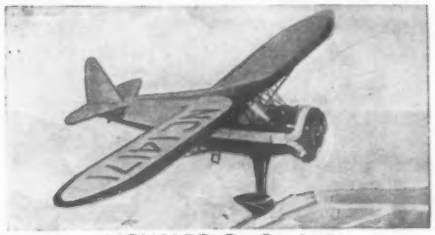

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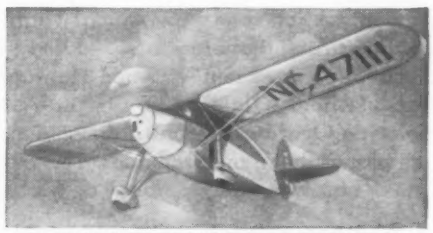

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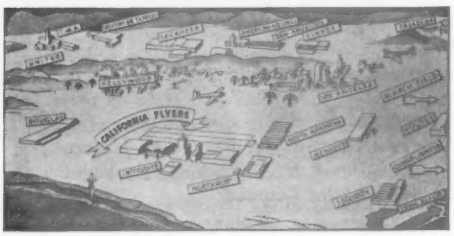

You can't match this map for aviation activity, for here are the great factories of Douglas, Northrup, North American, Lockheed, Vultee, Security, Kinner, and Menasco. Here is the terminus for United Airlines, T. W. A., Western Air Express, American Airlines, Pan-American Airways, and Catalina-Wilmington Airways. Here more planes are built and flown than any place in the United States. Here is the place to learn and earn.

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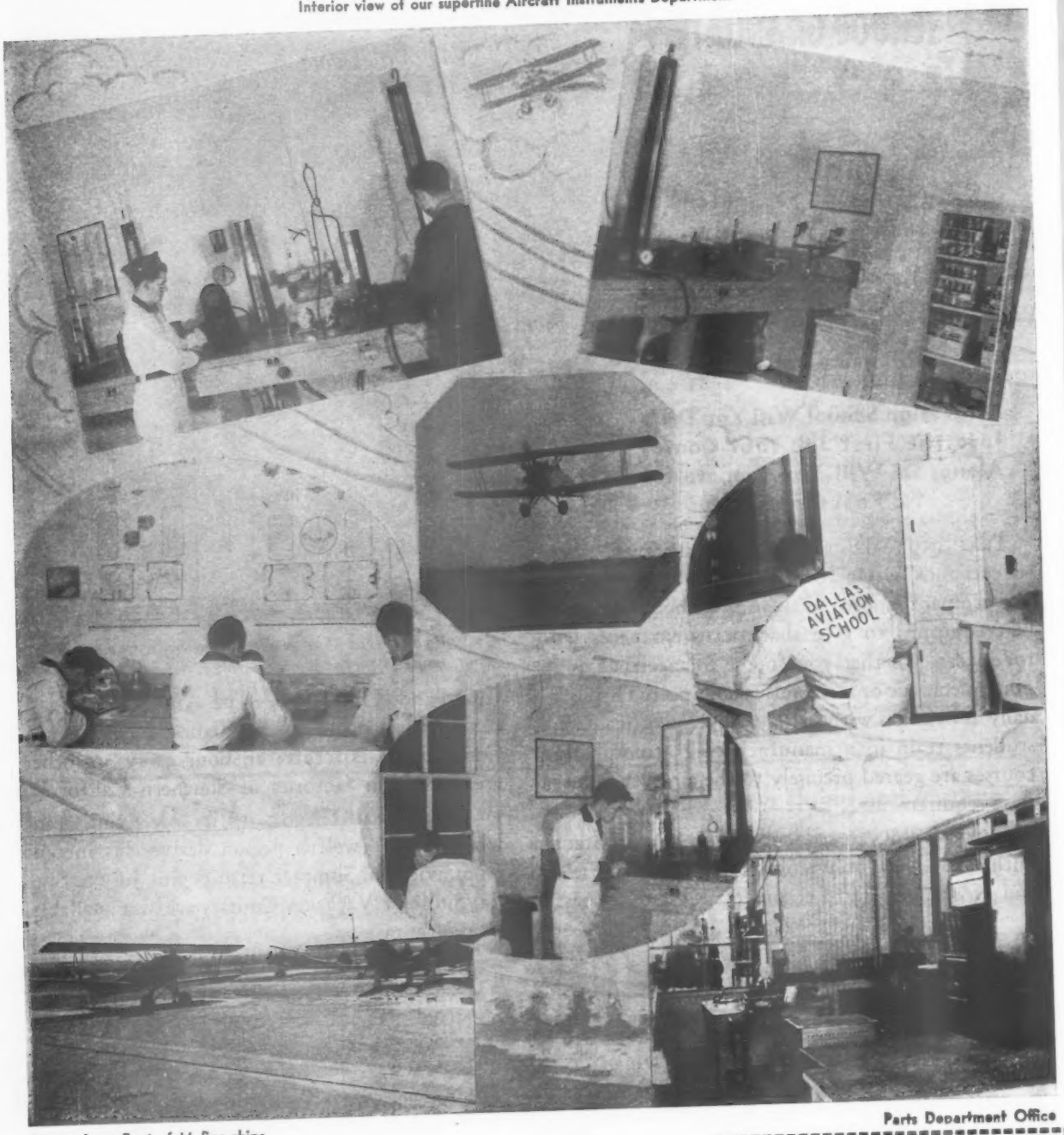

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POPULAR AVIATION

Volume XXIII JULY, 1938 Number 1

CONTENTS

FEATURES

"Men With Wings" 10
Is America Vulnerable to Air Attack? 12
Harrowers (full page picture) 15
Sky Rancher 16
Those Flying Turks 18
Loening is the Name 21
Why They Jump 22
Stainless Steel 25
Latin America Takes the Air 26
The Best Anti-Aircraft Gun Has Wings 30
Eight Cans of Applesauce 33
How Did They Fly? 34
Personalities 38
The Handy Line 40
"Junior . . ." 41
War Hen (full page picture) 42
The Latest in Killers 43
To the Rescue! 45
The Man Under the Hood 47
Quandary at High Altitude 49
The National Air Board Says 50
Adventure in the Stratosphere 54
Lightplane Patriot 57
POPULAR AVIATION's Flight Calculator 59
Forced Landings Can Be Funny 61

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ABOUT every five years, the daily press presents the thrilling biography of the deer-fly which, you will probably remember, has an estimated top speed of 880 m.p.h. This fly may also have other merits and virtues but they have not yet been recognized.

Now, what sticks me, is just how these gentle scientists have succeeded in measuring this terrific velocity of a freely flying insect. To accurately measure such a speed as this would be difficult in a laboratory with the flight along a predetermined line. Yes, there is something sour in this symphony.

* * *

THEY call it a deer-fly but it is more likely a humbug.

* * *

AND, all this reminds me of my claim, made more than eight years ago, that a speed of 500 m.p.h. under ordinary flying conditions and at ordinary altitudes is impossible with the present type of power plant.

The present record of 440 mp.h. is nowhere near 500 m.p.h. because this latter speed will call for nearly three times as much power as at 440 m.p.h. In other words, a tremendous increase in the power output will be required to overcome the 60 m.ph. that lies between 440 and 500 m.p.h. and then, the record speed will not be much more than a hop and surely not a practical flight.

* * *

WHEN an individual or an aviation club, purchases a plane, it will be found that this preliminary investment is only one of many coin absorbers that will follow.

In the first place, the hangar is generally overlooked, and when a large public storage hangar is not available, the ways-and-means committee ends up against a big bump after the plane is delivered to the field. As ordinarily constructed, a hangar is an expensive bit of merchandise and it seems doubly so when the club or

(*Concluded on page* 94)

Technicians in the top picture are mounting a Technicolor camera on the upper wing of Paul Mantz' ship. Mantz automatically photographs dog-fights he takes part in. Inset is Pilot Frank Clarke (left) discussing the film with Andy Devine who plays a mechanic.

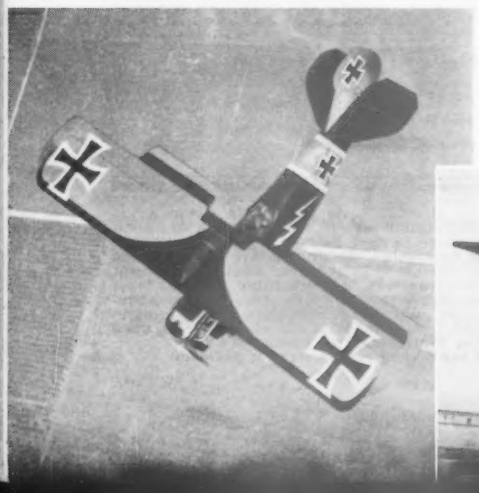
SCREENING "MEN WITH WINGS"

by EDWARD CHURCHILL

This will be as complete a history of aviation as Hollywood can make it. Probably starting another aviation-film cycle.

HOLLYWOOD'S biggest headache! That's the only way to describe the film capital's latest sally into aviation. Pilots, technicians, research workers, writers and cameramen all are working together with a double aim in making Paramount's "Men With Wings."

The first job is to put together a *true* story of aviation, covering the period from the flight of the Wright brothers on December 17, 1903, until the present time. The task is gigantic. Everything pertaining to the picture must be absolutely authentic. The second task is to do the entire story *in color*. Consider the latter alone. What color was used to paint the hangars at Bolling Field, Washington, D. C., back in 1917? And was the field named Bolling Field at that time? What color were the first air mail planes? What were the colors of the buildings at Curtiss Field, Long Island, when Colonel Lindbergh took off for his epic Atlantic flight? That's the sort of research that must be done in *every* phase of making "Men With Wings." Thousands of questions were answered by hundreds of textbooks, persons who were there, and from photographs. Three volumes of research material was compiled for the production.



Here are two "Fokker" warplanes that appear in the film. One is a fake, the other genuine. Which? Well, look closely and you'll see that the ship taking off below is the real thing. That at the left is a converted Travel Air. Note odd markings.

Easiest job was coloring the Nieuports of Squadron N87. William A. Wellman, the film's producer-director, actually flew with that squadron during the World War. He settled that problem:

"I flew plane No. 7. Those ships were camouflaged. I know I'm right; didn't I fly 'em for months?"

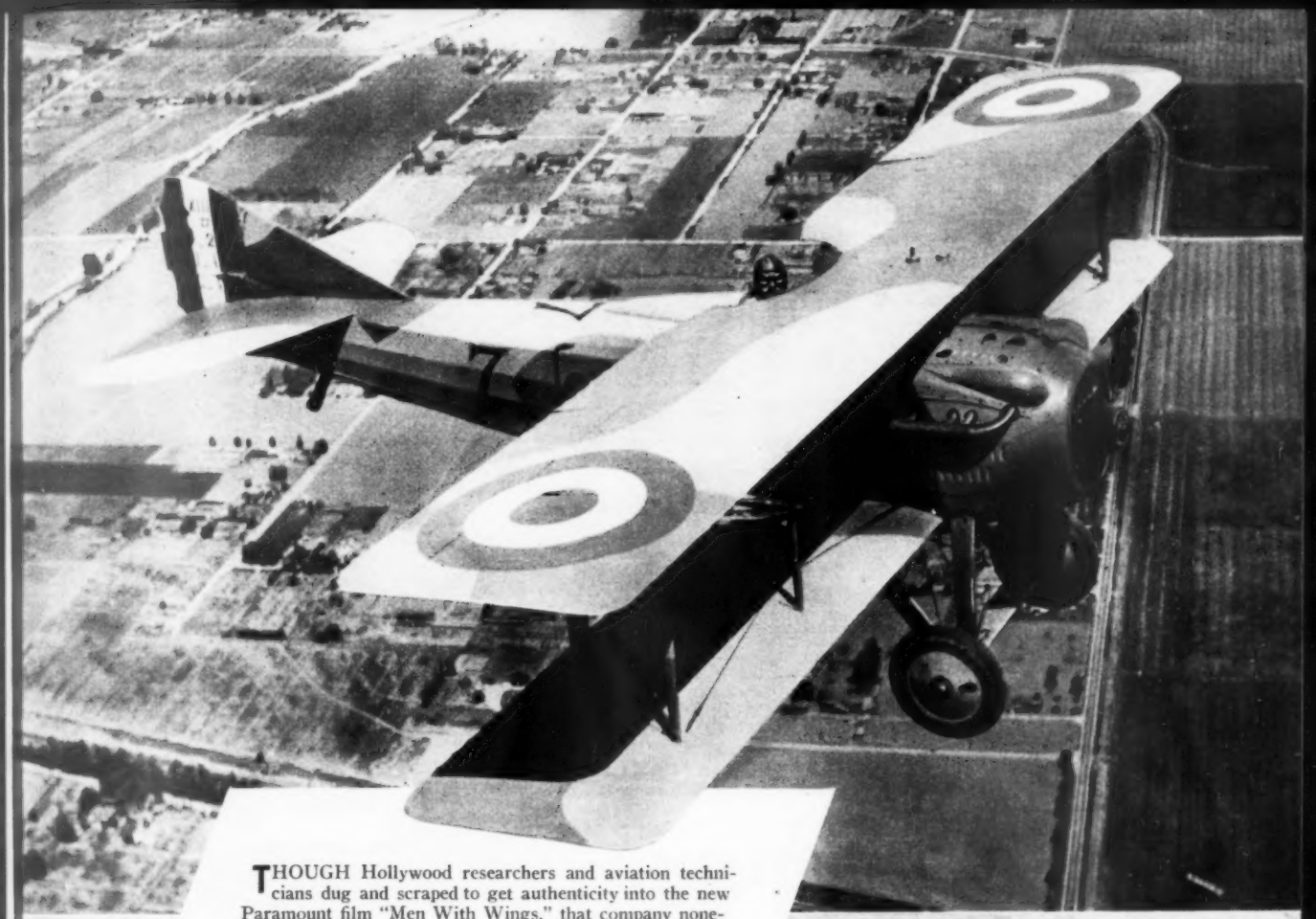
He did, all right. And came back from France with a bad back (injured in a crash), a Croix de Guerre with six gold palms, and official credit for having shot down three German planes.

"We'll get that part of the picture right," he said.

The story of "Men With Wings"? No use kidding about it. It won't be a series of re-created aviation events and nothing else. It's being made into a strong, running story—*but true*. Stars are Fred MacMurray and Ray Milland.

The aviation industry plays a potent part, naturally. Historic planes have been built to fly. Nieuports, Spads, Fokkers; all rebuilt at Metropolitan airport, Van Nuys, Cal. All these relics are being flown by Tex Rankin, Frank Clarke, Garland Lincoln, Howard Batt, Al Lary, Earl Robinson, "Chubby" Gordon and Jerry Phillips—all famed movie pilots. By the way; anyone know where Wellman can get a sister ship to the *Spirit of St. Louis?*

END



THOUGH Hollywood researchers and aviation technicians dug and scraped to get authenticity into the new Paramount film "Men With Wings," that company nonetheless ended up by having to "manufacture" copies of several types of World War planes. The airplane at the top of this page is a good rebuild job of an old Spad. The ship below was "manufactured" from an old Travel Air to a Fokker D-7. Flight photographs like those on this page will be even more appealing in the finished film, for they will be in color. Like "Test Pilot" (POPULAR AVIATION, June, 1938) Hollywood's "Suicide Crew" (POPULAR AVIATION, May, 1938) does all of the film's actual flying.

IS AMERICA

Easy prey for these modern bombers are the shipping, rail and financial centers like those shown in this picture.

by

LIEUT. A. G. J. WHITEHOUSE

Explorer Harrison Forman pointed out last month why Americans need not fear air attacks. Here, however, Lieutenant Whitehouse writes a rebuttal.

The modern bomb sight is deadly. The above bridge was bombed in tests. Airmen aimed only at "A" (left). Three 1100 lb. bombs were responsible for "B." One 1100-pounder made a direct hit in section "C."

Vulnerable TO AIR ATTACK?

Towering, packed New York City will make a target enemy bombers hardly could miss, even from high altitudes.

HAVE you ever seen a bomb drop in the middle of a city?

It's a beautiful and terrifying thing—particularly at night. There's something majestic and crashingly conclusive about it. You just stand there, fascinated perhaps; more likely rooted to a square foot of trembling pavement unable to move, unable to do anything but wait for Eternity.

I saw a bomb drop one night in London. I was on my way to a hotel. I had been to see a musical comedy, bearing of all titles, "A Little Bit of Fluff." A few minutes later, chunks of metal casing weighing several pounds were biting great mouthfuls out of the asphalt near where I stood. Shrapnel rained down leaving long scratches down the fronts of buildings that looked as though they had been drawn there by a monsterous rake.

In the sky above puny flashes of light decorated the blackness as the Ack-Ack guns put up an ineffectual defense. A pathetic if gallant gesture of metal tubed Davids attempting to stop winged Goliaths.

There was a grim flash at the corner of a building that made you rise to your toes and clamp your jaws. It seemed as though someone had drawn a red hot razor blade across the front of your teeth. It made you suck in your breath as you watched a long black jagged gash run down the front of the building.

There was a strange stillness before you sensed the thud and concussion of the explosion. You wanted to turn and say: "Look at that crack in the building. I wonder what. . . ."

But you never get that far. A weary wall broken by a death blow totters forward and the aged cornices droop like eyelids that close on Death just before it drops to the street burying dozens who stare up, unable to move.

There is thunder, a roll of a gigantic drum and smoke and dust mushrooms up leaving a jagged cross-section of the building for all to stare at. Tiny figures race across swaying floors and try to reach doors but they are swept away like fingerlings in a whirlpool and disappear in the dust and smoke below.

There are more crashes, more explosions, more puny pops of the Ack-Ack guns, but it doesn't matter now. You are alive and instinct makes you move one way or another. You clutch at crawling bodies and try to drag them somewhere—or you run away.

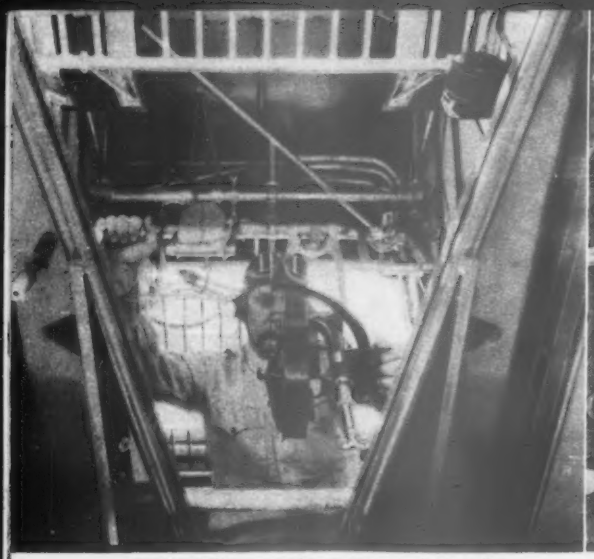
The next morning the newspapers say: "In spite of the terror, the danger of falling bombs, the public behaved splendidly. They were calm in the face of death. Some even joked and wandered out into the middle of the street to get a better view of the searchlights."

Some might call that propaganda, because it wasn't exactly true, but the statement had its place in the scheme of things. Those who stood in the middle of the street, as I did, did so because they were unable to move. We really believed what the newspapers said the next day . . . but we didn't sleep that night.

But why should I tell you all this? It has been told so many times before, and it is quite possible that many of you will witness much better, more devastating bomb raids right here in the United States. You won't have to go to London. They may bring it right to your front door!

Go ahead and sniff. It can happen.

Standard U. S. air bombs, left to right, are 1100, 600, 300, 100 and 2000 lbs., fragmentation, and the huge 4000-pounder.



Bomb sights are the strictest of Air Corps secrets. Though obsolete, this model was deadly.

Gasoline and oil storage tanks like these would be among the first objectives of enemy bombers. A few incendiary bombs could turn this into a flaming holocaust.

How will they do it, you may ask. What country has planes capable of such a show, regardless of where they start from?

Most of the powers that might want to attack the United States have planes capable of 3,000 mile flights. Most of them have aircraft carriers, or cruisers fitted with catapults from which planes can be launched to attack important centers.

If they haven't *we'll sell them some!*

Incredible? Of course not.

At the present time practically every first-line military plane in this country is now on the export list. Several forms of the Curtiss *Hawk* can, and have been bought. The long-range Consolidated PBY-1 is now available for those who would purchase it. The Grumman fighters are now being manufactured under license in Canada and several versions of the Boeing P-26 are in use in other countries. The Vought *Corsair* is for sale, if you have the money, and the Lockheed "14", which can be turned into a bomber overnight. is being purchased abroad for "commercial purposes." The Northrop fighters and attack ships have been sent abroad and you can go along the docks in New York City almost any day and see crates marked "Seversky" being hoisted aboard steamers headed for South America.

Planes which have been designed on research findings paid for by the U. S. Army and Navy are being indiscriminately sold abroad.

A short time ago the Martin firm sold a four-engined flying boat to Russia. It's a far better ship than any of our clippers and equal in many respects to the new Navy flying dreadnaughts. All they have to do is to copy it and we'll sell them the engines to make sure they'll fly.

But they haven't our new *Flying Fortresses* nor our Bell *Airacudas,* have they, you may ask.

No, not yet. But—Boeing is building a new four-engined transport, which according to reliable publicity has all the refinements and improvements of the *Flying Fortress,* except that it isn't armed. If Martin can sell a giant flying boat to Russia what's to prevent Boeing, Douglas or Consolidated from selling like ships to other foreign countries?

We sell everything else to China, Japan, Argentina, Russia and most of the European countries, what is to stop us from selling them planes?

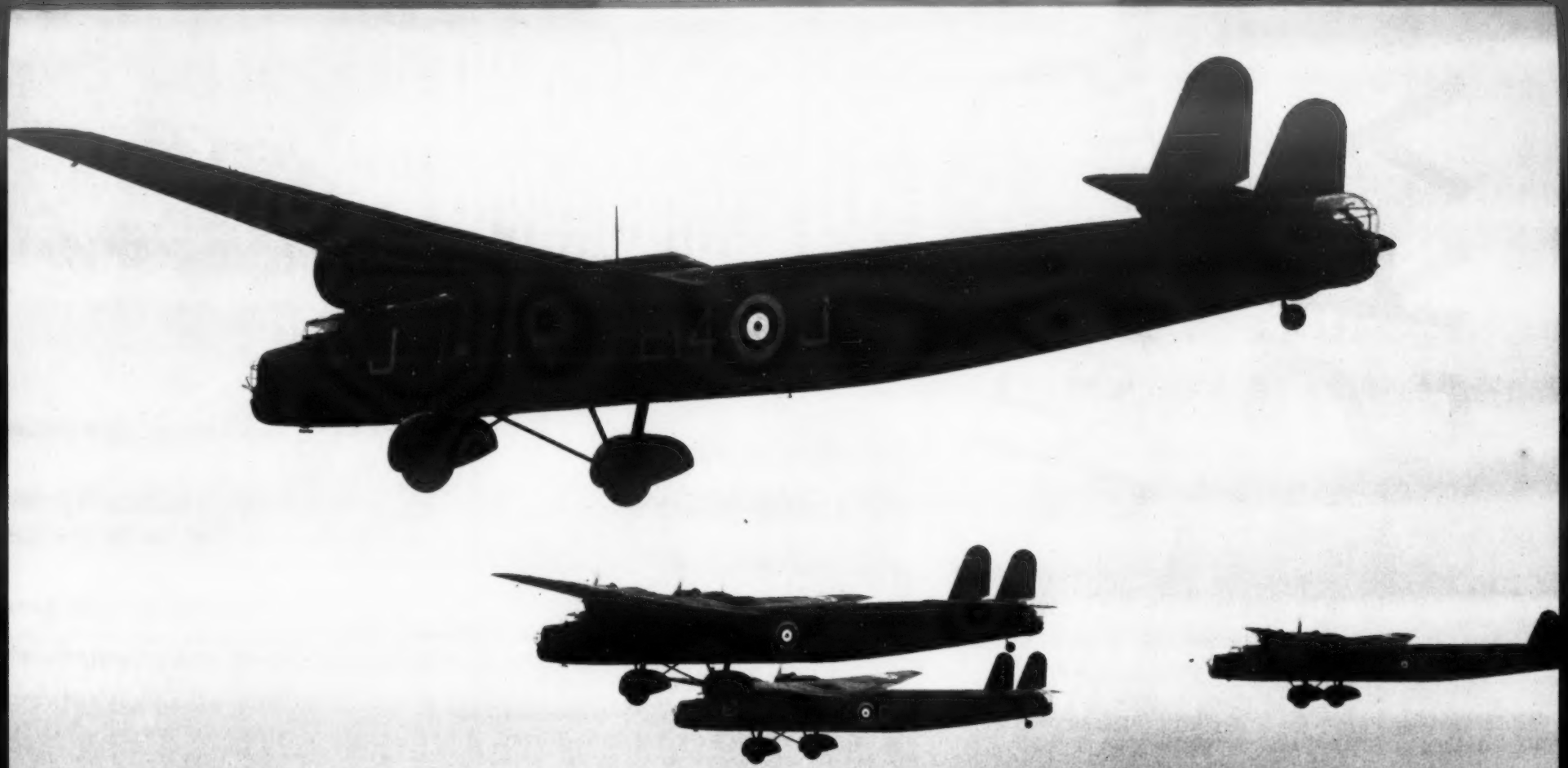
So it's Jingoism, is it?

Well every man who ever suggested any form of preparedness has been accused of the same. They call the Navy Department heads Jingoes because they want a few more battleships. They accuse the Army of the same because they want a few more tanks and anti-aircraft guns. I suppose the politicians could use that money themselves to get votes with, but unfortunately, when the guns begin to boom, it's the Army and Navy who have to face the bullets—not the politicians.

They stay at home and wave the flag.

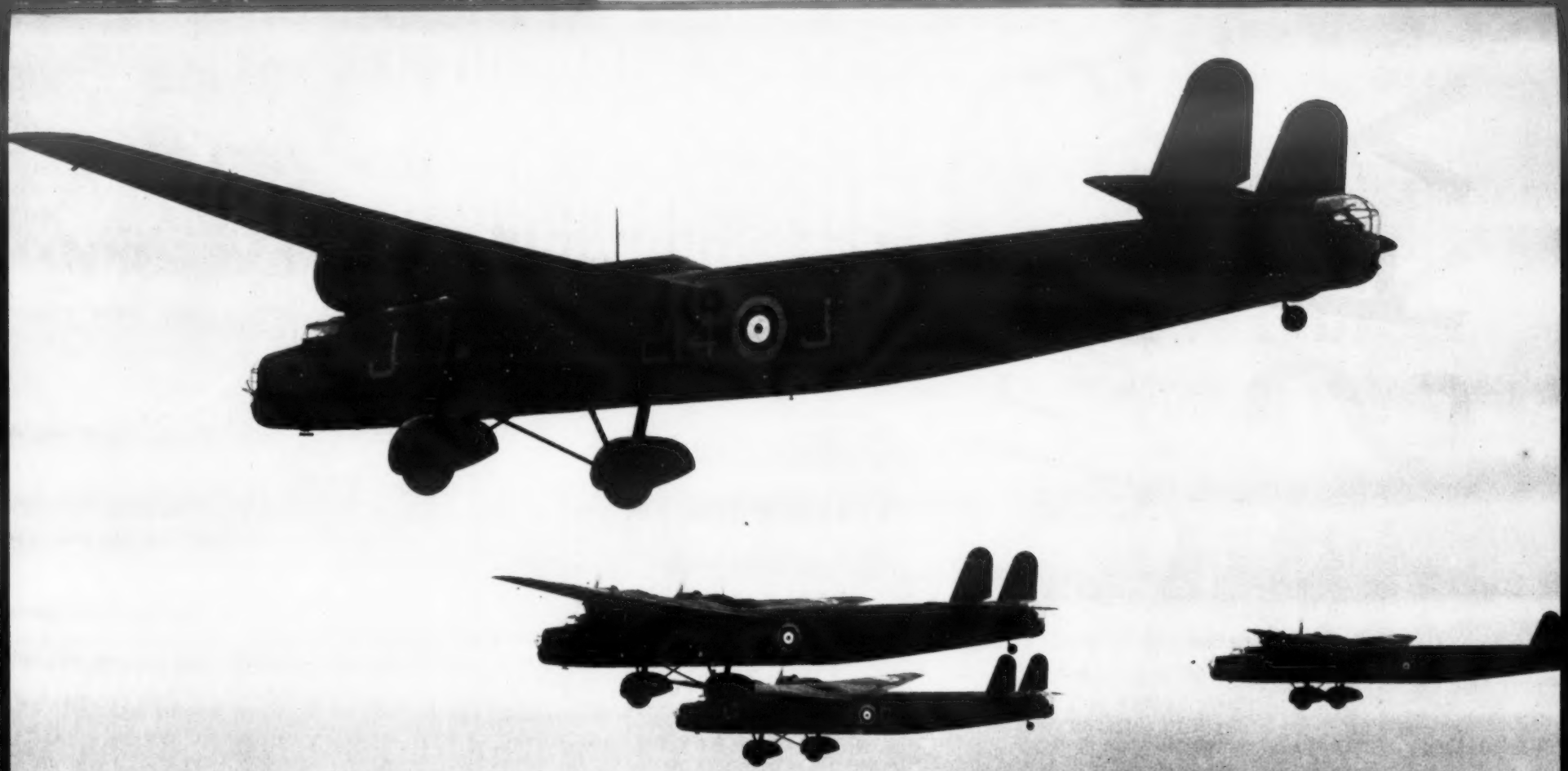
(*Continued on page 72*)

Attacking bombers would have a fine target in San Francisco and famed Golden Gate bridge.



HARROWERS

Flying in raiding formation, these British Handley Page "Harrow" bombers are well able of living up to their name.



HARROWERS

Flying in raiding formation, these British Handley Page "Harrow" bombers are well able of living up to their name.

Belden shot this remarkable photograph from an airplane. These pronghorn antelope are the world's fastest animals.

SKY Ranching

by KURT RAND

(Photographs by Charles J. Belden)

Meet Charles Belden, the man who actually leads the life we big city slickers have dreamt of. To top it off, the man is so air-minded he almost prefers a plane to his mustang.

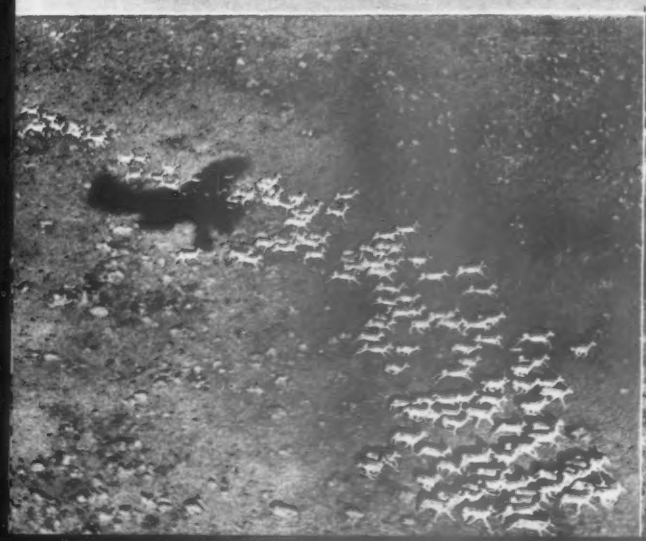
"AT 7:13 o'clock last night a high-winged Ryan monoplane landed at Newark airport with 16 young pronghorn antelope peering from the windows in the fuselage. The door of the plane swung open revealing the grinning faces of two men, one under a ten-gallon hat and the other under a five-gallon hat . . ."

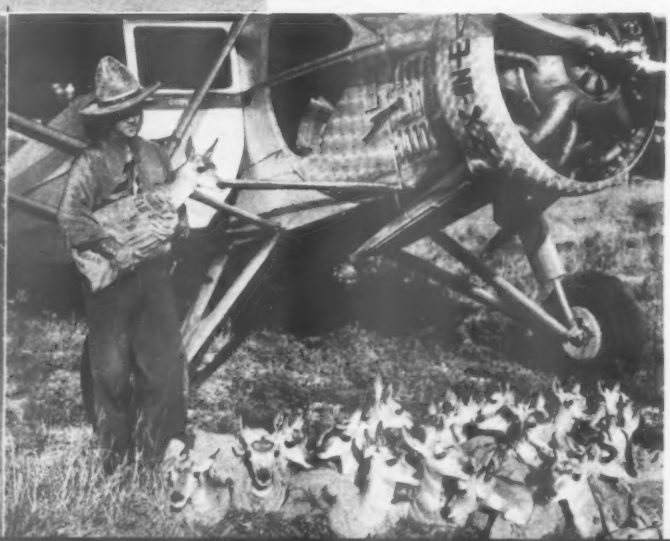
Such was New York City's introduction of a new industry, as told by an article carried in the New York *Herald-Tribune*.

The article went on to explain that the man under the big hat was Charles J. Belden, owner of a 200,000 acre ranch at Pitchfork, near Cody, Wyoming, and the other was Bill Monday, the cowboy pilot, whose

It's appropriate that these baby antelope get their last feeding on the Belden ranch from Ruth Nichols, famed aviatrix. The youngsters later were flown to an eastern zoo.

Another striking aerial shot of a herd of running antelope is shown below (left). That's Charley Belden himself (right) holding one of a plane-load of baby antelope.



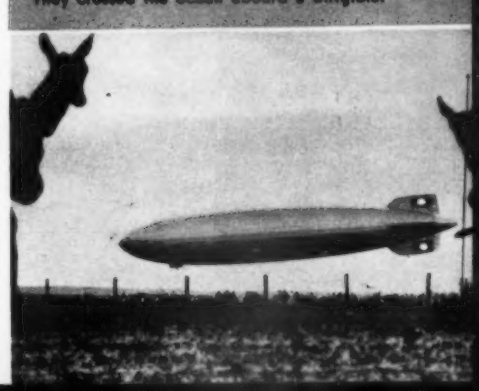


Carefully wrapped in sacks (right), baby antelope are loaded aboard the plane at Pitchfork Ranch for the long flight east.

Howdy, stranger! These big-eyed babies don't look as though they had a bad trip out. Why, that one boy's actually snoozing!

Ann T. Lope, co-pilot. The young lady in Pilot Bill Monday's arms looks a little excited at the prospect of a long air trip.

The two fawns below flew from the Bolden ranch to Europe in 60 hours flying time! They crossed the ocean aboard a dirigible.



resourcefulness and ability to pilot a plane as well as ride a horse, had brought him fame and fortune.

But the passengers, the three-months-old baby antelope—they were to re-stock the depleted zoos of seaboard towns and two of them were consigned to Berlin, Germany, via the *Hindenburg*.

Spectators gathered, reporters fired questions and cameras clicked as the little fellows were lifted from their flying home and given their rations of cow's milk. And the two men, the one in a ten-gallon hat and the other in a five-gallon hat, smiled with satisfaction at a good job done well. It was they who lived in the western prairie and mountain land and knew the free fresh breath of wild winds, yet had escaped the stigma of becoming blind to the progress and life of the big cities. It was they who had caught the babies lying beneath the sage, coaxed them through their adolescence, and then, on the wings of a cloudless morning, soared eastward, hurdling the mountains and rivers, forgetting the trees and rivers, unmindful of the physical restraint placed on the laymen about them who traveled by train or automobile, and like puppets, responded to the desires and whims of man-made travel lanes.

Theirs was an exciting life, full of the unexpected, brimming with romance, adventure, hardship, pleasure. And the delicate intermingling of the cowboy west with the modern civilization of the airplane and the gigantic airport, added a spice that brought complete happiness, a feeling that truly comes to few people.

The airport, and even the Ryan, although it displayed a large black bucking horse on its tail, were common sights to thousands, and the baby antelope gave momentary satisfaction to the on-lookers, then came the urge to turn time and space back in the flight, step into the ship and flash backwards through the miles until the dawn came up again and the plane settled on the green rolling prairie-land of the Pitchfork ranch along the foothills of the Rockies.

Out there, in the land that has produced such men as Jim Bridger and later Buffalo Bill Cody, still roam elk and deer, moose and mountain sheep, coyotes and wolves, and cowboy's fancy is the guide to his actions. There it is possible to ride a horse back for miles across the grass-land and rocky foothills without seeing sign of habitations, or to climb into the pine stripped mountains and find complete solice from the rush of civilization and its attendent problems which often mount to mental stigmas.

Such is the home of the airplane and its occupants, with the bright Wyoming sun smiling down on the green and brown of the prairie. And a half a mile away, over the edge of the bench-land and nestled along the cold, clear, fast moving waters of the Greybull river, is the home ranch, the Pitchfork, with its modern ranch-house, dude cabins, barns, corrals and antelope feed lots. Before it stretches the enormous green alfalfa fields—the fodder for winter feeding.

Everywhere, to the east and west, to the north and south, over hay-field and range prairie land little bands of the tawny prong-horn antelope, the unique and interesting speed-demons of the west. *Antilocapra Americana*, is the scientific name given them, and although they differ from the true antelope in that they shed their horns each year (and therefore have been put in a genus by themselves) are generally grouped with eland, the dick-dick, the spring-buck, water-buck and other gazelles found in Africa and on the deserts of Asia.

Outstanding among their characteristics is their curiosity and their speed. Naturally very timid and constantly on the alert they would have been hard targets for the bows and arrows of the Indians or black-

(Continued on page 92)

THOSE FLYING T

The modern foreign-built trainers above are part of Turkey's growing air fleet.

Parachute jumping is practiced from a training tower (left). Note falling jumper.

Turkey's soaring ace, Ali Yildiz, poses at the nose of his stunt ship (lower left).

One doesn't think of Turkey as an air-minded nation. The fact of the matter is that the Turks literally live aviation. Kemal Ataturk's nation even rivals Russia in aeronautical progress.

THIS was a historic old land, romantic with age and hardly the place you would expect to see an airplane—the barren steppes of Central Anatolia.

Here, the ancient Hittites had built an empire, then came the Persians under Cyrus, the Greeks under great Alexander, the Romans under intrepid Mark Antony, the Mongols under raiding Jenghiz Khan, and finally the magnificent Ottoman Empire under the sultans . . .

We halted our Arab horses a moment to light up cigarets and take a look around. But my gaze was attracted upward by a familiar voice. This was no "swish-swish" of a camel's hoofs nor "baa-a" of an Angora goat. It was more American. It was the voice of Baltimore—the voice of a $125,000 Martin bomber.

We watched the giant plane loom out of the distance and rush northwestward toward Ankara, the capital of Turkey.

I offered my Turkish companion one of my cigarets, an American-made one. He looked at it and then grinned, saying, "This helped pay for that plane."

He was right. International trade works like that. Turkey's biggest export commodity is so-called "Turkish" tobacco, and her biggest customer is America—where the rich, aromatic oriental tobacco goes into the blending of popular-brand cigarets. On the other side of the ledger, Turkey's biggest import from the United States in recent months has been military airplanes.

So it isn't far wrong to say that American smokers are building up Turkey's crack air force.

The "strong man" of Turkey, Mustapha Kemal Ataturk—founder and head of the Republic for the past 14 years—has no illusions about the politeness of his neighbors. He is arming Turkey steadily; and his air force is his darling.

Ataturk—a title meaning "father of the Turks" given him by his grateful people—is proud enough of the part he played in beating off the British during the last World War at Gallipoli, in the Dardanelles; but realizes only too well that if there had been warplanes with the British fleet at that time the outcome would have been another story.

And when he became his country's George Washington in 1922 by winning the Turkish War of Independence which drove out the Greeks, it was another daring campaign without planes that would be but a heroic failure in these days.

But the fact that Turkey is practically a new nation is a great asset. She is not burdened down with billions of dollars worth of battleships and fortresses that have become antiquated. When the republic, only 15 years old, began arming it shopped around for the most modern thing—and that meant, naturally, a concentration on aviation.

Ataturk is today building rapidly toward an air force of 500 first-line planes. And he will need every one of them, and more, if another big war breaks out. Turkey is on the spot.

Generally speaking, she is within aerial bombing range of all the Balkan countries and Russia, as well as of the Italians operating from their heavily-armed bases on the Dodecanese Islands in the Aegean Sea, of the British operating from Palestine and of the French, firmly planted in Syria.

Specifically, Turkey sprawls across the narrow Dardanelles straits. This is Soviet Russia's only outlet to the Mediterranean Sea from the Black Sea, and the only route other fleets can take to get at Russia. Anybody can see this from a quick glance at the map.

Turkey is so busy overthrowing the old traditions of the sultans and rebuilding herself on a modern basis that it is easy to believe her when she insists that she wants peace. But she lies where Asia and Europe come together, and it is doubtful if her wishes would be respected when war came

TURKS

by WILLIAM GILMAN

and involved this strategic region, as it inevitably must.

Turkey cannot be friends with everybody in war—with Russia, the Balkans, Greece and Italy at one and the same time. And on the other side, deep in the Orient, she adjoins Iraq, where the English and French precious oil fields lie; and also adjoins those stamping grounds of warlike tribes—Syria, Afghanistan, Persia and Turkestan.

It is a region where civilization was born, where Europe blends into the Orient, where highways are scarce, mountains and deserts are terrific obstacles and the airplane is the logical answer.

Already, Ataturk has had a chance to test out his air force in quelling rebellious border tribes on his Asian flank. Back in 1925, he had fifty leaders of the Kurdistan Nationalist movement hung. That kept the nomad Kurds—who sprawl across the boundaries of Turkey, Persia and Iraq, quiet for a long time.

But early in 1937, they arose again along Turkey's southeastern border. Led by Sheik Seyit Riza and his son, Hussein, the Kotchouchay tribe swept through the country, demanding freedom from taxation and the right to carry arms.

Anyway, Ataturk—who is certainly a "strong man" although he denies vehemently being a dictator—did not waste time parleying with the butchering rebels. He sent out 25,000 crack troops and an air fleet. The result, ten months later, was the complete annihilation of the Kurds, who could hold their own in guerilla warfare on land, but had no defense for air bombs and strafing. At Elazis, Shiek Seyit and 15 of his henchmen were executed.

And the heroine of the week throughout Turkey was comely Sahiba Goschen, Ataturk's adopted daughter. This handsome lass is an example of the new Turk. She wasn't satisfied to be just one more beauty on the ballroom floor. She went into aviation with a vim. And when the campaign against the Kurds began, she finally cajoled Ataturk into allowing her to go along. She went—in a single-seater attack plane. And she was praised throughout Turkey for her part in machinegunning the rebels from the air.

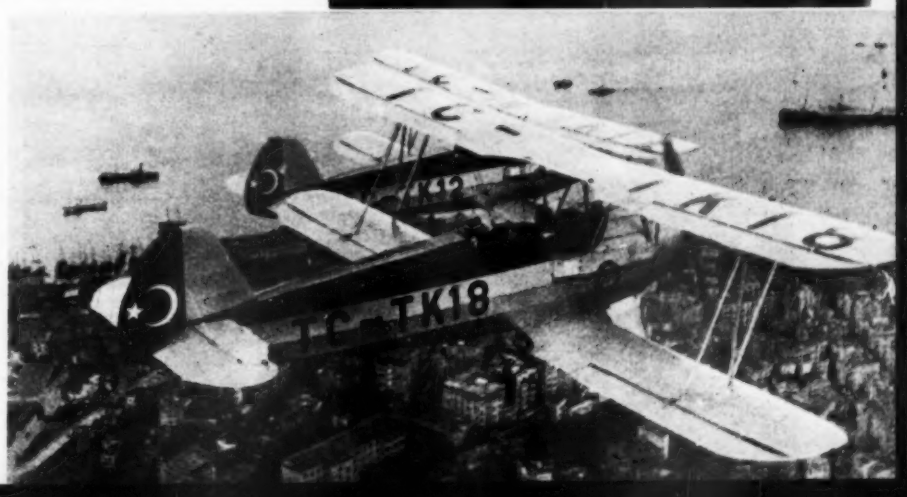
The girl is an example of what is going on in Turkey. An air force is a necessity, but it is also an enthusiasm.

The strange thing about the Turk is that, like the old gray mare, he ain't what he

Above is the modern home of the Turkish League for Aeronautics.

American air hostesses? Far from it. The girls at right are able pilots.

The Turkish trainers (below) are flying over historic Constantinople.



This boxcar carries an American Curtiss fighter, is symbolic of Turkish respect for Yankee aircraft. A Turkish factory builds Curtiss airplanes under license.

used to be. Among the things he doesn't do any more now since Ataturk took over affairs, is bankrupt himself trying to support a harem, or flop down on the ground at sundown to pray toward Mecca—or ride a proud Arab charger into battle. It's the airplane now.

The Turk has become a "flying fool." He'd rather fly than eat that oily rice he calls *pilaf* or drink that anise thunderbolt he calls *raki*. In my opinion, it is always an effective way to learn about something like the progress of aviation by watching how it is getting along abroad. And my only conclusion is that Turkey is doing more, considering her relative poverty, than America is doing, man for man and especially woman for woman—as far as aviation is concerned. That is ironic because Turkey, like other nations, must depend upon Yankee aeronautical ingenuity.

The finished Turkish product is the Army Air Force. But just as significant in the long run is the League for Aeronautics, which is independent of the Army although semi-official in nature. One of its big projects is the *Turk Kushu*—meaning "Turkish Bird." Into this organization, which is only two and a half years old, are swarming thousands of Turkish children, eager to become flyers.

The schooling is entirely free. All one needs to get his or her flying license and brevet is ability. The League begins by enrolling school children between the ages of 14 and 18. At this stage, they go through a rigorous training in the building and flying of model planes. It's done in every city. At the first term last year, for example, 12,000 children enrolled.

Then, when the students get out of secondary public school at about the age of 18, they begin to fly—in gliders. The Turkish idea, as can be seen, is to give the novice a thorough schooling in inexpensive things first—the country hasn't enough money to spend on airplane crackups.

This glider training is given during the summer vacation. In the second summer, those who have survived the tests, go to Camp Inonu, where they learn how to stunt in gliders. And in the third summer, when the student is about 21 years old, he or she goes to the camp at Ankara. Here for the first time, the novice gets a chance at a plane with a motor.

At Ankara, it usually takes less than a month of flying to get the coveted brevet and license. This is because the student has learned the entire art of flying from the ground up, from building model planes to navigating with a glider in wind currents. The matter of learning how to operate a motor plane becomes merely one of learning how to land and take off.

This is very easy, say the Turks, and the novice doesn't count the "hours" of flying for his license. His emphasis, instead, is on the number of landings. Many of them, with their gliding experience, become capable airplane pilots after fewer than 50 short hops with a motorized plane. But they are usually made to land about 95 times before they get a license—this is so that the slower students will not feel ashamed of themselves.

They take their success and failure to heart. At Camp Inonu last summer, of a batch of 22 girls who took their tests, only four passed. Every one of the other 18 was weeping that following noon at lunch!

The eliminations are drastic. Turkey is paying the bill and doesn't want merely mediocre pilots. Out of a thousand who begin with model planes, only about one hundred survive the final tests.

Men and women are treated alike. It is only when the student goes to university that any distinction is made. There, the youth goes on with his training—this time in racing planes. When that course is finished, he is qualified to join the Army Air Force as an officer, or join the reserve. The women, of course, don't go into the army—at least, not yet. But they are expected to go into government service.

Lieut. Commander Feridun Dirimtekin, acting head of the League for Aeronautics, was eager to let me see for myself that the airplane, and not the harem, symbolizes the new Turkey. It was an eye-opening tour. We started out from the league's modernistic headquarters building in Ankara, where we saw in one classroom 20 young men and five young women listening to a professor explain the intricacies of aeronautical geometry and trigonometry.

Our first stop was at the glider camp, about 10 miles out of town. Here were a dozen hills and a couple gliders in use on every one of them. In snappy uniforms, girl and boy members of the Turkish Bird were busily taking their beginning flights and tugging the gliders back up the hills again.

At the hangar, Dirimtekin proudly showed us part of his fleet of 100 gliders. All were painted red, with the Turkish star-and-crescent emblem appearing in white. One trim, long-winged craft, he indicated, was the glider which the Germans used in 1936 when capturing the world's record of 40 hours in the air. Turkey had bought it, so as to duplicate its lines. Nearby stood another which had been bought from Russia for the same purpose. The rest were Turkish-built.

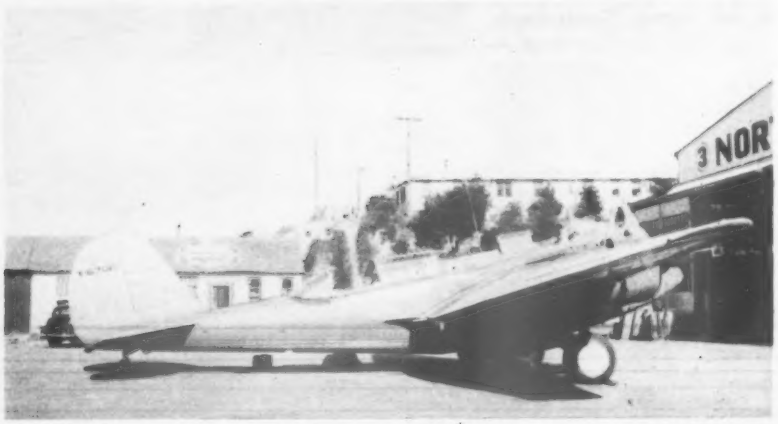
Dirimtekin explained apologetically that Turks had been flying gliders only since 1935 and as a result, the best they had done so far was stay in the air 18 hours and a half, and operate from an altitude of about 11,000 feet.

He called out, "Ali!" and a young chap appeared, clicked his heels and saluted proudly. This was 28-year-old Ali Yildiz, the Turkish gliding champion, who had won sixth place in international competition. He was an instructor now at the gliding camp.

Ali listened smilingly as his commander explained our desire to see him show his stuff. Then he strode to a squat glider with stubby, powerful wings—it was his favorite for acrobatics.

A motorized plane towed him up in ever-increasing great circles to a height of about 8,000 feet. Then the line was let go, and we stood there with open mouths as Ali, the young Turk, did what his hard-riding an-

(Continued on page 82)



Turkish bombers largely are American export Martins similar to the Army's B-10s.

Loening IS THE NAME

by ROBERT H. RANKIN

The Grover Loenings are one of the few "aviation families" in New York's social register. That famed designer, though, still enjoys flying, recently stirred up a battle over trans-Atlantic airlines.

Mr. and Mrs. Grover Cleveland Loening today are identified more as socialites than anything else. The couple was photographed above as they attended a recent championship polo tourney at the Meadowbrook Club, N. Y.

OF COURSE you have heard of him. His name is synonymous with amphibian aircraft and he was the designer of America's first strut-braced monoplane. A swank individualist, he is honestly recognized as one of aviation's foremost engineers.

Loening, whose full name is Grover Cleveland Loening, was born on September 12, 1888, at the United States consulate in Bremen, Germany, where his father was consul. As a lad he became interested in flying and he spent much of his time building model planes from wire and tissue paper. In 1908 his mother took him to see a real airplane (if the animated box-kites of that day could be dignified by that name) fly. The old crate crashed shortly after taking off and as young Loening surveyed the wreckage, he decided to become an aviation engineer.

After completing his elementary education at the Cutler school in New York City, Loening entered Columbia University. There he founded the first student flying club in America. In the spring of 1911 he was graduated with a Master of Arts degree in Aeronautics, this degree being the first such ever awarded by an American college or university.

Soon after his graduation, young Loening joined the old Queen Aeroplane Company as chief engineer and, while with that concern, he built the world's first monoplane flying boat. The following year he joined Orville Wright at Dayton, Ohio, and within a very short time he was made general manager of the Wright organization. In that capacity he developed what was probably the first short hull flying boat in the world. During the course of his association with Orville Wright, Loening collaborated in much of the pioneer work that is responsible for the present advanced state of the aviation industry.

Early in 1914 Loening left the Wright organization to become chief aeronautical engineer for the United States Army. Immediately upon taking over his new duties, he condemned all of the Army's old Wright and Curtiss pushers, thus paving the way for the procurement of more modern equipment. While with the Army, Loening designed the efficient Signal Corps Tractor, the machine with which Lieutenant B. I. Jones established a three-passenger endurance record and with which Lieutenant T. F. Todd set a world cross-country record.

In 1916 he resigned his position with the Army to become vice-president and chief

(Continued on page 92)

By far the most popular Loening design was the Navy amphibian below. An early Loening model was the monoplane above.

Though somewhat ahead of its time, the Keystone-Loening air yacht was a success in its day. Comparatively few were built.

by
LLOYD S. GRAHAM

WHY THEY JUMP

NO airplane pilot takes a plane up with the thought of leaving it up there and coming home another way. But every once in a while a pilot does find it necessary to leave his aircraft and take to silk. Records show that more than 1,200 men and women have so saved their lives, many of them more than once.

Careful study of personal statements, official reports and other direct sources of 643 documented cases show some crazy happenings and should be fairly representative of the whole 1,200, plus the ever-increasing numbers of new jumps, reported and unreported.

The palm for freakish causes of jumps still goes to Leonard J. Povey, who missed death by a hair on August 12, 1934, when his plane smashed into a giant buzzard. Povey was aviation instructor for the Cuban army at Camp Columbia. He was flying a high speed pursuit plane along the coast. The incident ruined both the plane and the bird. Povey made his parachute jump without difficulty but landed in the sea, from which he was rescued by a fast hydroplane.

For the sake of classification, we include the cause of the Povey jump in that category entitled, for want of a better term, "acts of God." It could not possibly have been foreseen. God put the buzzard in the way; or the bird, just plain "ornery," happened to fly that way. Anyhow, it was not Povey's fault, or the fault of anyone else on earth.

Oddly enough, 64 jumps, almost exactly 10 per cent, were the result of various acts of God. They could not have been foreseen. Fog alone accounted for 34 jumps—about five per cent. Snow and ice accounted for a dozen. Various types of storms caused 14 jumps. Lightning caused one jump and smoke caused two jumps.

The largest number of emergency jumps was caused by control failure—173, or about 27 per cent of the 643. Structural failure with 111 jumps—slightly more than 17 per cent of the 643—was the second in line of causes. Collision, almost exclusively among Army pilots in formation or aerobatic fighting, was third in line with 108 of the 643 jumps, a little less than 17 per cent. Motor failure caused 92 of the 643 jumps, or slightly more than 14 per cent. Fire might have been included with motor failure in most cases, but it was studied as a distinct cause, whereof there were 46 jumps or slightly more than seven per cent. The few instances of propellor failure were included under the general heading of structural failure.

One of the odd causes which defied classification was the emergency parachute jump caused by being thrown out of a plane. In many instances this was the fault of the person making the jump, but not always. Some such cases were perilously close to the acts-of-God classification. There were 31 instances of the emergency jumper being tossed out of a plane—nearly five per cent, believe it or not.

If you think there is anything funny about using the parachute in emergency when thrown out of a plane, you will get a different slant from Flying Cadet James A. Philpotts, who was spilled out about 10 o'clock the morning of April 13, 1936, near Mather Field, California. Philpotts was scoring record bombing. There was no window from which he could make the observation, so he had to lean out of the bomb-bay. He had a microphone in one hand and a scoreboard in the other. It was not so easy to hang on. When the plane hit an air bump, it was too much for him and out he went, scoreboard, microphone and all. The air speed was about 103 m.p.h., but the surprised cadet pulled his ripcord and landed nicely.

It is a curious fact that eight of the 643 jumps (slightly more than one per cent) were made when planes ran out of gas. This does not include jumps in snow or fog when the pilot deliberately flew his plane until the gas was exhausted, thinking the sky would clear so that he could make a landing.

Classic example of this running-out-of-gas business is that of A. T. "Tex" Frolich, an Early Bird who was flying a plane on August 26, 1922, running the main tank dry on a time and distance test. It cut out over the Cumberland mountains in Tennessee and when "Tex" switched over to the reserve on the three-way nothing happened.

Walter Lees' controls jammed.

Lt. E. H. Barksdale: plane failure.

Lt. L. L. Koontz: loss of control.

Gunner W. M. Coles: mid-air-crash.

The Caterpillar pin is gold, has ruby eyes. Owner's name is on back.

You have read of the Caterpillar Club. Members "joined" against their will but were thankful afterward. Their reasons make colorful reading.

He figured there was no gas in the reserve tank. There was no place at all to set the plane down. So he went over the side. It turned out that some bright mind had connected up the three-way incorrectly so that the reserve was really on the cut-off. How "Tex" was supposed to know that remains a mystery.

Let us go back for a moment to the subject of control failure. Here is an odd one that shows what control failure in the air may mean. Lieut. Archie J. Old, Jr., of the U. S. Air Corps Reserve, was, on February 26, 1935, pilot of a plane near Atlanta, Texas. Private H. G. Thorne was passenger. Old had been flying for a half hour and was at 3,500 feet when he started a turn to the left. Suddenly the stick seemed to come loose in his hand and the plane started off in a wide diving turn which kept getting tighter until it was spinning. He tried every known way to bring the ship out of the spin, but there was no pressure on the controls whatsoever.

Old was in front. He raised up, reached back and unhooked Thorne's safety belt, told him to jump. Thorne stood up to go over the side, so Old turned back and cut the switches.

"By this time," says Old, "it was spinning like a top and I was beginning to black out to the extent that when I tried to crawl over the right side I could not make it." He reached up and grabbed a hand-hold on the upper wing, pulled himself up so that he stood on the fuselage between the cockpits and dived to the right, getting a terrific crack on the right shoulder from the tail as he did so. He pulled the ripcord at about 500 feet, missed a tree and landed in a field.

Thorne did not fare so well. Every time he stood up in his cockpit to jump, the centrifugal force of the spin would force him back. But, after Old got clear, the loss of his weight caused the ship to come out of the spin and almost level off. It was only then that Thorne got away, pulling the ripcord as he jumped. Eye-witnesses say he was but a hundred feet above the ground. He missed death by inches and came out of it with a sprained ankle.

Structural failure does not always mean the break up of wings, although this is the most common item in this category. But listen to this tall tale, which is not so tall but that it is true. Lieutenants Franklin Kendall Paul and E. A. Hillery went up for a trial flight in a Martin bomber at 2 o'clock on the afternoon of October 9, 1933. Neither knew it, but in the take-off the right half of their landing gear buckled. The first they knew that anything was wrong was when a pursuit ship pulled alongside with chalk marks on the fuselage which spelled out "landing gear no." A fine predicament.

Through the communicating set Paul and Hillery discussed the situation. It looked as though the best chance was to land on the water of Hampton Roads. They zoomed the field but were waved up. In a few minutes up came an Army Boeing with the one word JUMP chalked on the side. But Paul and Hillery jokingly agreed that they had enough gas for 45 minutes and they would stay up until it was exhausted "to give the ever-increasing crowd below a chance to see the show and lessen the fire danger."

Hillery, the rascal, put the plane through some aerobatics that were very tricky and hair-curling for a staid old bomber. When the gas was nearly gone he flew two miles away from the field and buildings and climbed to 3,000 feet. At a signal from

Lindbergh leads all Caterpillars.

Lt. W. W. White: mid-air collision.

Lt. C. D. McAllister: collision.

Sgt. Jack Ready: forest fire!

When trouble developed in an Army airplane near Fresno, Cal., in the summer of 1930, these six airmen took to their parachutes and saved their lives. The sextet of Caterpillars, shown from left to right, are Sgt. Caleb A. Davis, Private Mervin Stokes, Corporal W. L. Green, Privates Tony Wasilevich, Roy Lockwood and John Koziak.

S. J. Samson was a two-time Caterpillar. He was killed recently in an airline accident

Hillery, Paul unbuckled his belt, climbed out on the cockpit step, waited until Hillery had climbed out on the wing, and then he jumped. As the tail surface flashed by he pulled the ripcord and did not throw it away. He looked up and Hillery's chute was already open. Both landed unhurt in a hay field. The bomber came down in a gentle, normal glide and crashed resoundingly into trees.

A certain amount of collision stuff is almost inevitable in any military flying service, because of so much formation and mass flying. Furthermore, it is only fair to say that by no means all of the participants are student pilots. It does not require much of a collision in the air to make parachute jumps necessary to continued life and liberty. A landing wheel grazes the wing of another plane and it is quite likely that one or both planes will be junk in a few moments. A smashing, slam-bang collision is a rare thing; but listen to this one:

Lieutenant Arif Erkus, a Turkish military pilot, whose home address is Istanbul, Turkey, had made a practice parachute jump back in 1932. In October, 1933, he was doing photo-machine-gun practice with another pilot at around 5,000 feet. Through one of those split-second miscalculations, the two planes, each traveling at the rate of 250 kilometers an hour, came together almost head-on. Lieutenant Erkus was dazed and he was practically a prisoner in the cockpit with the wreck of his plane fast whirling to the ground. By a superhuman effort, he, while falling head down, managed to push himself out of the cockpit and fall free, head down. The chute opened at about 2,000 feet and the rest was easy, except that there were pieces of the two planes flying all around and some of them came uncomfortably close. The other pilot was killed.

It so happened Lieutenant Erkus made still another jump two years later on September 12th. In that case it was merely a little item of a propeller suddenly breaking and flying away. The plane went down tail first and the motor proceeded to shake itself to pieces. The pilot took to silk and landed in a tiny, cleared space in a forest.

No doubt one of the most disconcerting things that can happen to a pilot is to see his plane catch fire. And of all those on record, the experience of Flying Officer Leslie C. Bennett, flying with a group out of Northolt, Middlesex, England, on August 16, 1928, stands in a class by itself. Bennett had been participating in aerial maneuvers and was flying over London with his group when he suddenly became conscious of almost unbearable heat. Flames swept back from the motor and suddenly enveloped Bennett and most of the fuselage.

Bennett had no chance to combat the flames or try to land. He instantly went over the side. If he had hesitated a second he would most likely have been burned to death. Other pilots in his group had seen the flames before Bennett. Thousands of people in the streets below watched the incident with gasps of horror. But there was nothing any of them could do to help Bennett. When they saw the parachute open, there was relief, but the pilot knew that parachuting over a city was not without hazard. If he landed in the street he might be run down. Then, again, he might be dashed against the side of a building.

(Continued on page 92)

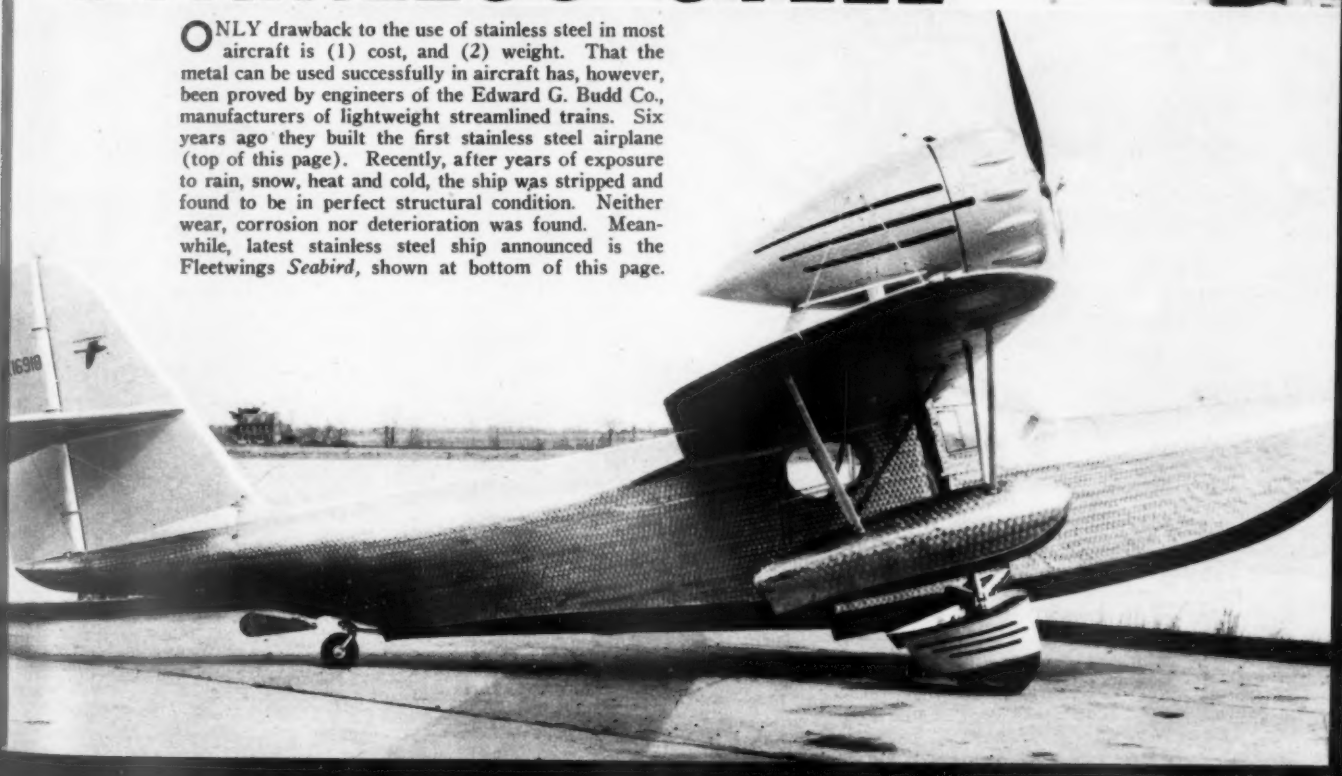
Jack Caldwell: plane fell out of control.

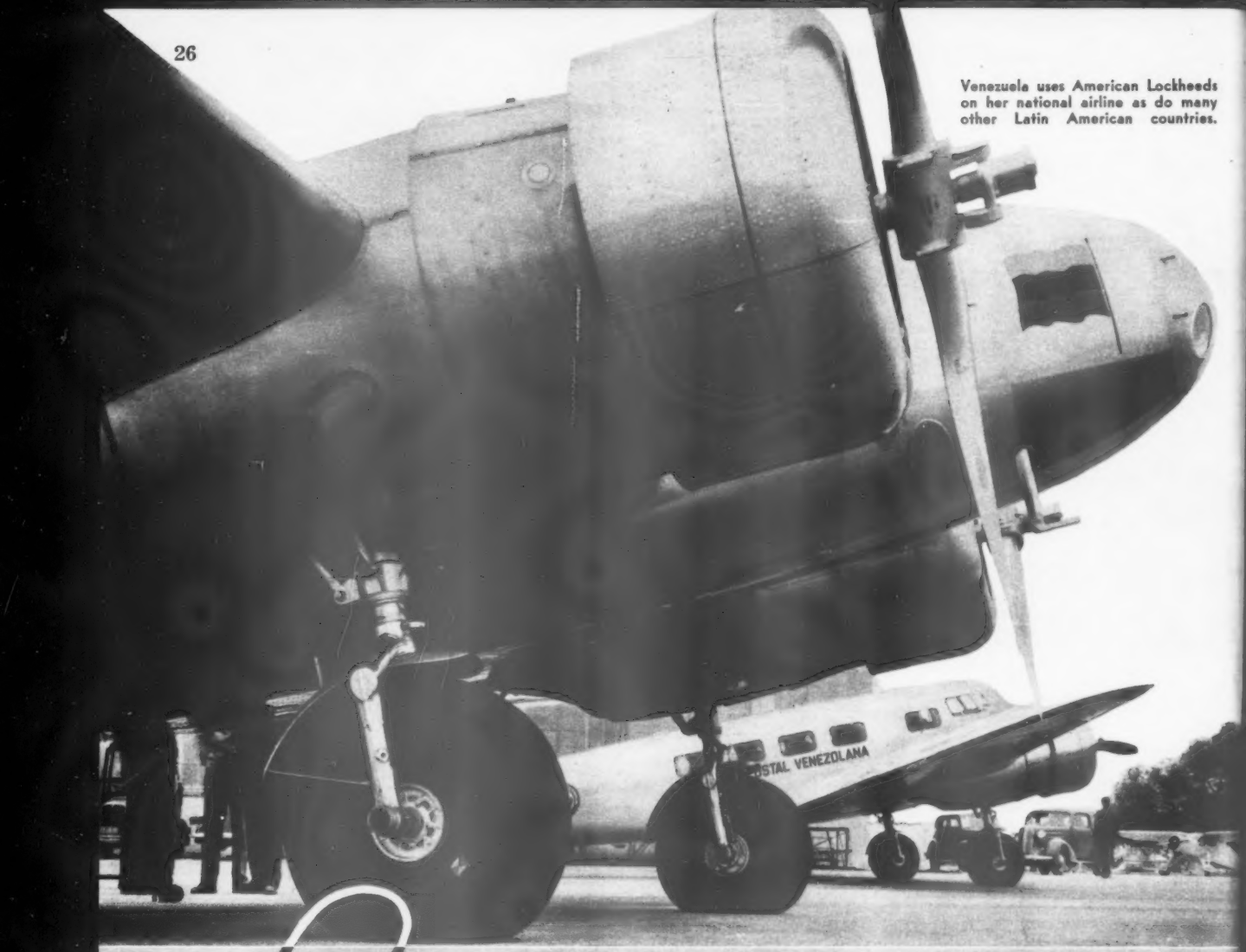
Mrs. Wayne H. Fisher: storm and fog.

"Tex" Frolich: first glider Caterpillar.

STAINLESS STEEL

ONLY drawback to the use of stainless steel in most aircraft is (1) cost, and (2) weight. That the metal can be used successfully in aircraft has, however, been proved by engineers of the Edward G. Budd Co., manufacturers of lightweight streamlined trains. Six years ago they built the first stainless steel airplane (top of this page). Recently, after years of exposure to rain, snow, heat and cold, the ship was stripped and found to be in perfect structural condition. Neither wear, corrosion nor deterioration was found. Meanwhile, latest stainless steel ship announced is the Fleetwings *Seabird,* shown at bottom of this page.

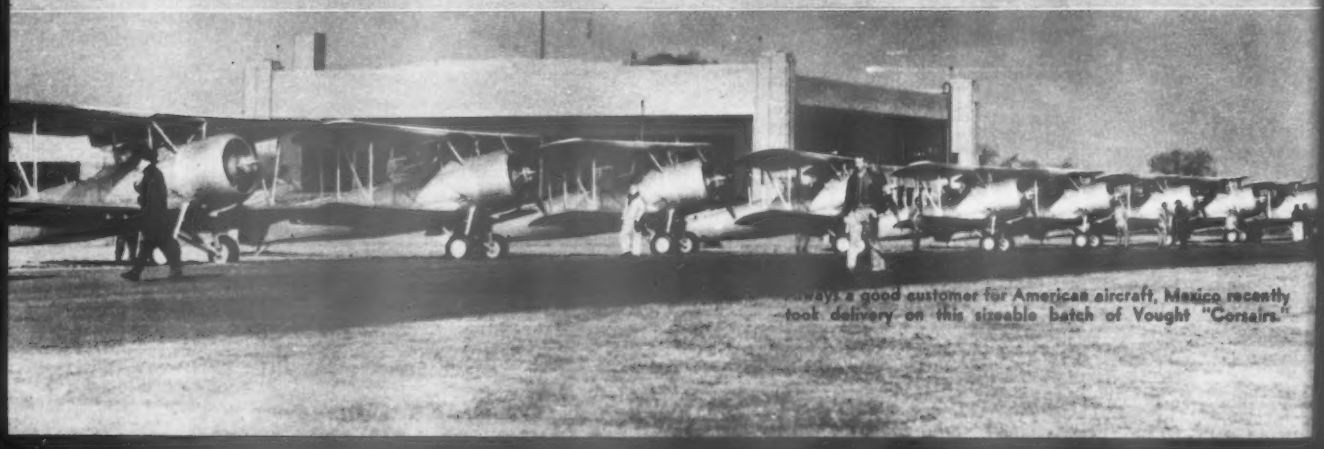




Venezuela uses American Lockheeds on her national airline as do many other Latin American countries.

Latin America TAKES THE AIR

by GORDON SEAR WILLIAMS



...ways a good customer for American aircraft, Mexico recently took delivery on this sizeable batch of Vought "Corsairs."

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THE airplane has proved to be one of the greatest civilizing agents ever to be introduced into world commerce.

Especially true is this statement when applied to the vast continent to the south of us comprising the countries of Latin America. Until the advent of the airplane into South and Central America, transportation was, at its best, a slow and extremely hazardous undertaking.

Although travel was possible in the summer months, winter with its torrential rains turned lazy streams into raging torrents and made all but paved roads impassable morasses. With this in mind it is not difficult to understand why the airplane was soon sought out as a means of comfortable, speedy and safe travel. Air travel has proved itself to be one of the cheapest means of travel as well; especially so when the time element is taken into consideration.

It will be remembered that Alberto Santos-Dumont, who was to South America what the Wrights and Curtiss were to this country, had begun experimental projects into air-flight as early as 1898. A native of Brazil, Santos-Dumont soon made a famous name for himself by winning the $50,000 Deutsch Prize in Paris. Although these early flights were made with powered balloons, he also experimented with various types of heavier-than-aircraft, many of which were successful.

Airplane service did not begin in earnest however, until the end of the World War, when a regular airplane service was started in Columbia by the German-Columbian "Scadta" company. This company has been very successful since that time and is today one of the larger operating companies of South America.

Many barnstorming Americans were also attracted to these southern lands after the great conflict in Europe, and for many years airplanes of wartime vintage were to be seen in many of the larger cities. It is interesting to note that an American, Elmer Faucett, is now operating the largest air service in Peru, "Cia de Aviacion Faucett S.A." with headquarters at Lima.

Air routes of this country require regular flying at altitudes of from 5,000 to 18,000 feet above sealevel. *Wasp*-powered Stinsons and special Faucett monoplanes with 550-h.p. *Wasps* are used. Other activities include aerial survey, crop dusting, and special long distance charter flights.

Bolivia has but one large privately-operated line. Lloyd Aereo Boliviano which has been running scheduled lines since 1925. Junkers ships are used.

Brazil has a total of seven air transport companies, and with Argentina surpasses all other of its neighboring countries in this field. All but two of these seven companies are owned and controlled in Brazil. Pan American Airways and Air France are the two foreign owned airlines.

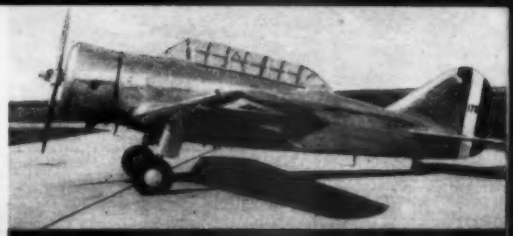
Chile boasts one large home-owned airline, National Air Lines, which uses Fords, Sikorskys and Dornier "Wal's." Pan Americans and Air France also have connecting lines within the boundaries.

Costa Rica is served by the Empresa Nacional de Transportes Aeros as well as the Pan American system. Other companies are used as feeders, mainly operating from the coast to inland centers of commerce.

Cuba and Mexico, as our closest neighbors, deserve special notice. Mexico has a number of airlines whose routes cross Mexico in all directions. Pan American also is very popular and runs regular service to the main cities. Cuba depends upon Pan American for the majority of its aerial transportation, but also supports the Associadad Cia Nacional Cubana.

Among the other countries in Latin

Most active export market for American aircraft is South America. Americans should take pride in the fact that Yankee aircraft predominate "down under," despite heated competition from foreign builders. Latin Americans prefer U. S. aircraft.

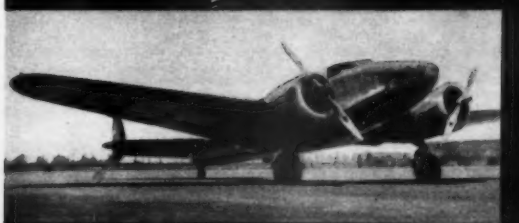


A batch of Spartans like that above was recently delivered to the Mexican army.

This Stinson "Reliant" is one of several American types owned by the Mexicans.

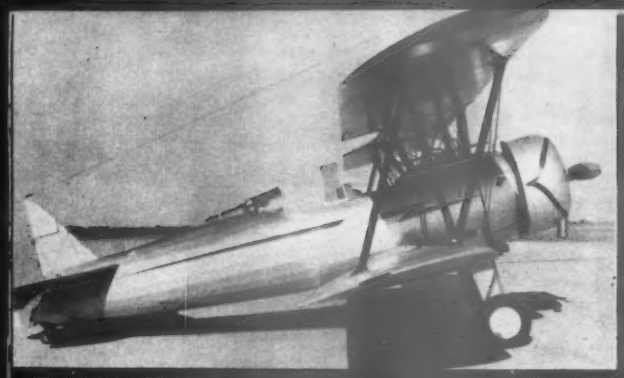
Argentina recently purchased several of these North American NA-16-1P trainers.

Vought scout-bombers are used in South America. This belongs to the Argentines.

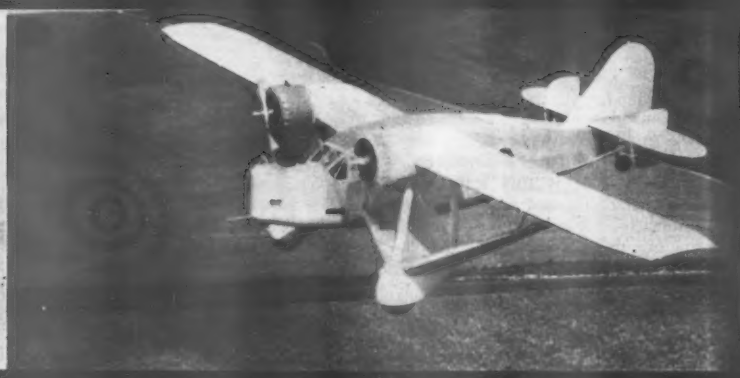


Several Lockheed military transports like the above "12" are being used widely.

Bolivia uses "Condor" bombers (below). The Brazilian ships at left are Wacos.



Stearman is finding business good in South America. This is one of several advanced trainers for Brazil.



The Colombian government bought several of these Bellanca bombers (they are the only ones of this model built) and uses them both as land- and seaplanes.

Argentina, a great user of American ships, bought this Douglas "Dolphin" for its navy.

Fords still are popular for rugged South American flying. This belongs to Colombia.

Even Seversky is after the Latin American market. Colombia also bought this model.

Several nations use the popular Waco (below) as a trainer and light bomber.

America we find that Salvador has two large companies, Transportes Aereos Salvadorinos and Transportes Aereos Centroamericanos. Panama is represented by Isthmian Airways while Venezuela has recently purchased a fleet of new Lockheed Electras for Aeropostal Venezolana service. Uruguay has no airlines of its own and depends upon Pan American and Air France to expedite passengers and mail.

Military aviation has also been definitely "on the go," with most of the nations having at least a few ships in their army or naval air services. Many war surplus machines found their way into this market, and it is not until the last five years that the last of these ships have been written off the books. American manufacturers sold a few ships to some of these countries in past years, with Brazil, Argentina and Chile buying the greatest numbers. However, England, France and Germany seemed to be the favored countries from which most military aircraft were imported. In the five years just past we see quite a different picture, with the United States again taking the lead in supplying the majority of both civil and military aircraft. South American imports of American equipment for 1936 (fiscal year) included the following items: Mexico: 49 airplanes to a total value of $501,000. Central America and the West Indies: 33 airplanes at a value of $190,000. Argentina imported 64 planes and 85 engines, as well as miscellaneous equipment, at a total value of $2,269,000. Brazil bought 14 airplanes and 45 engines at $550,000 while other Latin American exports amounted to over $1,180,000. Figures for 1937, although incomplete, show large sales for this period which may exceed those of 1936.

The excellent record of the now world-renowned Pan American Airways System in South and Central America has been discussed many times, but it is doubted if many of the aviation-minded of this country know that many of these so-called "backward" countries have excellent and up to date air forces.

Argentina is the one South American country having its own aircraft factory. Besides the many American military ships in the Argentine military and naval aviation services, there also are a number of the trim, low-wing trainers and transports built at Cordoba by the Argentine Military Aircraft Factory.

This company has functioned since 1932, building planes wholly of its own design. The Ae.T-1 was the first transport to be developed. This low-wing job uses an Argentine built Lorraine "W" type water cooled engine and carries 2 pilots, 5 passengers and baggage.

Construction is of the normal steel tubing and wooden wing type. Top speed is rated as 139.7 m.p.h. and it can cruise at 121 m.p.h. for 680 miles. These ships are in use on the Aero-Argentina line running between Cordoba and Buenos Aires.

In 1934 another new ship appeared, the Ae.C-3, a light, two place training monoplane. A number of these were supplied to the civil aviation schools, and in addition 12 military versions, known as model Ae. M.O-4's, were built for the army.

The Ae.C-2 uses a 175 h.p. Wright R-540 engine, while the Ae.C-3 uses a 140 h.p. Siddeley engine. A commercial cabin job, the Ae.C-1, was also built, and was supplied with a Siddeley *Mongoose* engine. The Argentine Military Aircraft Factory also builds Wright *Cyclone* and *Whirlwind* engines under license from the Wright company.

Military aeronautics in Argentina is directly under the command of the Director General of Aeronautics. This branch of their national defense is divided into the following groups: director of aero-technics, military aircraft factory, three military air bases, the military aviation school, two observation groups, two fighter groups, and two light bomber groups.

Besides home-built ships, many foreign ships are in use. Among these are the Dewoitine D-21, Breguet 19, Junkers K-43, and Avro trainers. Most of this equipment is either obsolete or fast becoming so however, and is being rapidly replaced with new aircraft of various types, mainly of American design. Types now coming into use include the Martin 139-W (B-10B), North American NA-16-1P, Stearman "76," Lockheed "12," and others.

Naval aviation is a separate unit and functions much as does our own Naval Air Service. It has in its present squadrons the following types: Dewoitine D-21, Fairey III-F, Fairey *Seal*, Supermarine *Southampton*, Vought *Corsairs*, Keystone *Pelican*, Consolidated *Fleet* and *Fleetster*, Fokker *Super-Universal*, Douglas *Dolphin*, Curtiss *Hawk*, Consolidated P2Y-3, and Grumman JF-3.

The military aviation service of Bolivia operates under what are perhaps the most difficult conditions in the world. The main airport, that at LaPaz, is at an altitude of 13,500 feet above sea level!

At present only about 60 ships are in use and are mainly of British and French types.

This Boeing "95" is a converted mail plane used some years ago on American lines. The Honduran government bought some of this model and converted them to bombers.

When this Boeing fighter was released for export by the U. S. government, Brazil bought several for her air force.

which for some reason or other seem to perform well in this rarefied air. It is said that many embryo pilots have lost their lives while training in this rarefied air due to the poor handling qualities of most airplanes at such a height.

Brazil has two branches to her aviation service, as does Argentina. The military aviation school at Campos dos Affonsos, Rio de Janiero, is probably the most famous airport in South America. The military aviation service not only has its usual tactical establishments, but as well undertakes the regular flying of the mails and averages about 20,000 miles per week on scheduled routes.

The Naval branch has three main bases: at Rio; on the Island of Santa Catherina, and at Porta Alegre. Ships now in service are mainly of British and American manufacture. Among these are the following types: Boeing No. 256 (F4B-4), Curtiss-Wright *Osprey*, Vought *Corsair*, Curtiss *Falcon*, Fairey *Gordon*, DeHavilland *Moth* and *Fox Moth*, Bellanca *Pacemaker*, Waco "F," 10's and *Taperwing*, and Consolidated *Fleet*.

The Republic of Chile has about 150 pilots in its air force and about 2,000 soldiers and mechanics. Ships in use include the following: Vickers *Vixen*, Curtiss *Falcon*, Junkers A-20, Curtiss *Hawk*, Wibault fighters, Sikorsky S-38, Loening C-2, Avro 504, and 626, and DeHavilland *Moth*.

The air force of Ecuador consists, at present, of a very small number of ships. In 1936 the entire force was made up of one Curtiss-Wright *Osprey* fighter, and six Curtiss-Wright trainers. Additional ships have been ordered since, it is believed.

The Aviation Corps of the Republic of Peru is under the control of the General Inspector of Aeronautics, and consists of the naval air force and the military aeronautics service. The aviation centre at Las Palmas consists of the training squadrons (both primary and basic). Naval aviation schools are at Ancón. Types in use include Vought *Corsairs*, Boeing 40-B-4, Douglas M-4, Morane 110, Hanriot 240, Potez 394-A, Curtiss *Hawk*, Ford trimotors, and Caproni fighters.

Uruguay has very few actual military airplanes. It has but one military flying school and only six military airports. Potez 25's and DeHavilland *Tiger Moths* are in use at present. The Naval Air Service uses Italian-built Cant. "18," and "21" bombers.

Venezuela's air force consists of but one squadron and less than 30 ships. They are mainly of old types.

With the aid of the airplane civilization is finally reaching the most remote corners of Latin America. Regular airlines now serve all of South America's 13 capitals, and regular scheduled airlines total nearly 65,000 miles. Likewise, military aviation is progressing by veritable "leaps and bounds" in all but the smaller countries and remarkably efficient aerial units are being formed.

Like all enterprising American businesses, U. S. aircraft manufacturers and operators are fighting foreign competitors persistently. More and more money is being spent in South America; that continent's raw materials and resources (most of them untapped) alone make her a particularly strategic group of little nations to be in good terms with. An excellent example of the farsightedness of the American aviation merchant is that of Pan American Airways. Long ago, Juan Trippe and his original associates saw South America as a rich, progressive field in which to set up operations. Pan American has done so well along these lines since, that that American firm has, so far as United States competition is concerned, a veritable monopoly on the South American continent. But the mere fact that Pan American is the only big U. S. aviation operator firmly entrenched throughout South America does not by any means signify that Juan Trippe has clear sailing. The Germans are hot on Pan American's heels. So are the French. Recent events in Brazil particularly also prove that Italy may soon join the aeronautical fray in South America.

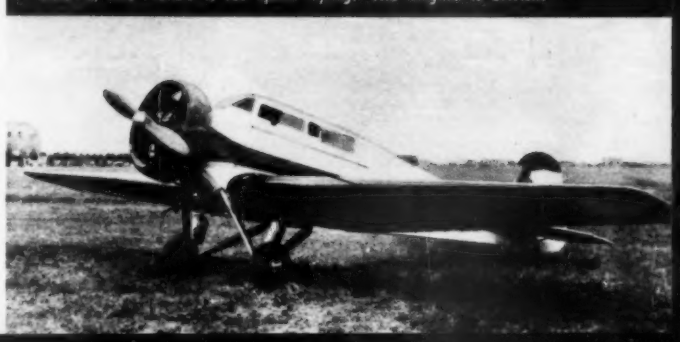
But the United States is far from being "asleep at the switch" so far as Yankee progress in South American aeronautics is concerned. The recent good will flight by a squadron of Army Air Corps *Flying Fortresses* to Buenos Aires and return is proof of the State Department's attitude toward our southern neighbors. Though ostensibly a flight to prove the might of American air power to the world in general, the Army's visit to Argentina actually was to honor one of that nation's diplomats. So Latin American flies—on Yankee wings.

END

This single-engined transport was designed and built by Argentine engineers. It is powered with a French Lorraine engine.

Another Argentine product is this monoplane trainer built at the military aircraft factory. It is known as the Ae.C3.

Following the same basic design of the above Argentine-built models, this Ae.C1 is for sport flying. The engine is British.



THE BEST ANTI-AIRCRAFT

Perfect example of a winged anti-aircraft arm is the Bell "Airacuda" and its two cannon.

FOR centuries nations have guarded their land frontiers. The Great Wall of China is an ancient monument to that. For countless ages peoples have stood guard where land and ocean meets, ready to repulse any invader of their sea frontiers. On the chalk cliffs of England still stand moss-covered old stone towers, erected the better to observe the approach of an enemy stealthily coming by water. On the southern tip of Mindanao in the Philippine Archipelago stands a high stone edifice crudely erected by a primitive people to warn of approaching Moro marauders.

It is only in our time, within the life time of men not yet senile, that nations have discovered a new boundary—their sky frontiers. When the Great War burst on a miserable world, the airplane was but a decade out of the cradle; it had been a little less than 11 years since Orville Wright had made the first flight in an airplane. There are those who will tell you that the airplane played but little part in the changing fortunes of that struggle. It is quite true that airplanes then were but crude vehicles judged by present day standards. They were poor, stick and wire harbingers of what was to come. Yet, it is not quite factually accurate to say that they played no vital part in the World War.

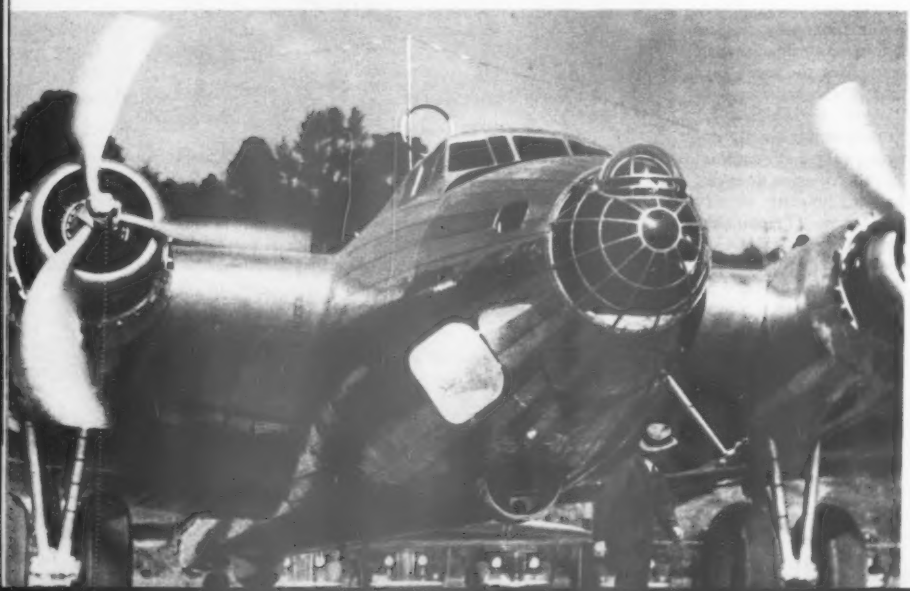
London was attacked by 13 Zeppelins and 128 planes all told, yet near the end of the war nearly 300 British airplanes and about 30,000 officers and men were employed continually to man the air defenses of London, and the British General Groves said these were, "barely sufficient against a mere handful of German machines."

Estimates indicate that Allied bombing planes inflicted a monetary loss of nearly 400,000,000 dollars on Germany. Considering the crates we then called bombing planes, those are significant figures.

Whatever we may think of the effectiveness of the airplane as a military weapon today (and there are those who still say, because of ignorance or prejudice or lack of intelligence, that airplanes can be stopped, that they cannot sink battleships, that they are but minor annoyances in war), there is no gainsaying that several of the European nations are simply jittery for fear of air invasion.

I noted recently a statement made by Sir Samuel Hoare, Home Secretary for Great Britain, on the subject of what he termed—"Air Raid Precautions" in which he said:

"What a depressing commentary on the follies of human nature that in the year of Grace 1937 civilization should be forced to defend itself with gasmasks and underground cellars, that human beings should

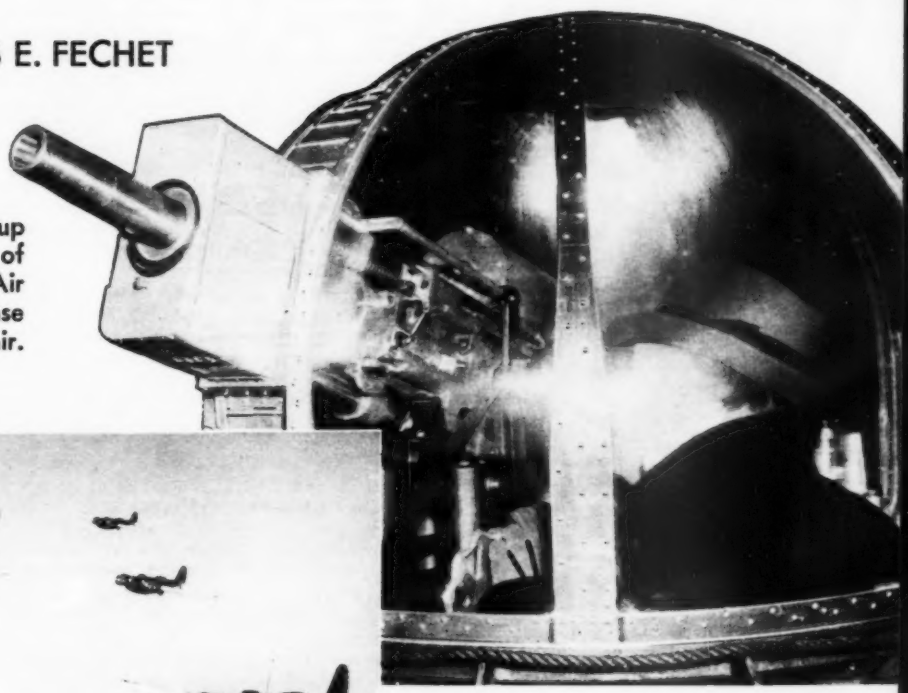


The Army's huge XB-15 can carry a whole battery of air-cannon almost 6,000 miles.

GUN HAS WINGS

by MAJOR-GENERAL JAMES E. FECHET

Here is a potent theory backed up by the knowledge and experience of the former chief of the U. S. Army Air Corps. It helps make a stronger case for American rearmament in the air.



The gun above is no pipe dream. It is a working model of a new 37 mm. rapid-fire air cannon now being tested secretly by the Air Corps. The gun is as flexible as a machine-gun and can be mounted on fleet bombers like those at the left. A hit with one shell on any part of an enemy ship could wreck it.

be taught how to become once again cavemen, and to shelter themselves in darkness and in the bowels of the earth. A cynic seeing these things would abandon all hope.

"But detest as they might the need for this expenditure and the causes that led to it, as practical men and women they must set their teeth and see to it that until the world regained its sanity, the priceless treasure of British civilization should not be endangered by ruthless and inhuman raids."

Here in America we may be heatedly arguing about the powers and limitations of aircraft, but in Europe they have made up their minds. Air raid drills are held regularly. Whole cities are darkened for air raid practice; barrage balloon nets are being raised; alert nets are being established and tested; gasmask drill even by the civilian populace is common place. In Japan, too, the devastating and demoralizing effect of the airplane is conceded and air raid discipline and protection are stressed. I suspect also that the poor Chinese now agree fully that the airplane is a real danger which must be reckoned with, not theorized about or scouted. The most reliable rumor from the Far East indicates that the reason for the folding up of the stout Chinese defending armies, after a stubborn stand against great odds, was not because they were worsted in battle but because they could bring up no ammunition or food; all the rail lines leading into their fighting zone being cut and kept cut by Japanese bombing aircraft.

It is all right to say, as I have heard it said recently, that the airplane has been a disappointment in the current wars—if you can answer this argument: All the leading nations of the world have watched the present wars with uncommon zeal. In fact they have been doing little else. Every one of them is now building aircraft at unprecedented rate. England, Germany, Italy, and probably Russia as well—each is now placing greater emphasis on its air forces than on either its armies or navies. In each of these countries it has been reliably estimated that nearly half of every armament dollar is now being spent on air munitions—airplanes, engines, air bases and bombs.

This brings us, by a devious route, to some fair questions: What is a proper air defense? What can stop airplanes and where should they be stopped? What is the most economical antidote to the air menace?

Let us reason by illustration and example. Let us assume that a fleet equal to our own is proceeding toward our shores convoying an expeditionary force from an enemy nation determined to make a hostile landing on our shores. Our Navy undoubtedly would move out to meet that oncoming force. They should meet far at sea. If they do not meet beyond the range of the enemy aircraft, our fleet cannot prevent enemy airplanes from bombing our industrial centers, rail lines, munitions stores, and our cities—all fat, fine air targets. So, these two equal navies would steam to contact far at sea, where each would throw everything at the other, including the sponge and the water bucket. What would happen? What happened at the battle of Jutland? Each would be torn and battered and beaten. Both sides would lose heavily. Right now, reading about the battle of Jutland one almost wonders why the British term themselves the victor. Their losses were as great as the Germans. Each side withdrew to check losses, heal wounds and assemble badly scattered forces.

Having been equal in strength at the beginning, success would turn on superiority of training, command or maneuver, but there is no reason to believe that each side would not lose heavily, be badly decimated by the encounter. All of the forces of each would be within the range and full influence of the opponent.

There they stand, those two fleets, like

Navy airmen put much stock in powerful dive-bombers like this.

two evenly matched boxers in a ring, each with six-ounce gloves, standing toe to toe and slugging it out. What a difference it would make if some ring side spectator leaned over the ropes and cracked one of those opponents over the head with a stout bludgeon!

Now here is where the long range, land-based bombers come into the picture. It is now and always will be possible to build a land-based bomber of longer range, greater power, and higher speed than a water-based bomber. The water craft either must be small so that it can operate from the limited deck of a carrier, or it must be burdened and weighted by an enormous hull to permit its landing and take-off from the surface of the water. Land-based bombers could take off from inland bases, fly to that naval battle and deliver the decisive blow. Remember that naval battle, if our shores are to be protected, must take place beyond the range of the invading sea-based planes. We must catch their planes on their carriers, still "on the nest," so far out that they have not yet launched their planes. If they have already taken to the air to engage in the naval battle, then their carrier bases must be destroyed. There you have the proper way to beat back an invading foe approaching on water—by a combination of our naval force and our land-based army air force. That is the only safe, sure way.

Anti-aircraft defense is not, as many would have you believe, a ring of cannon with searchlights and listening horns sitting around our vital areas. It is more than that—much more. It is a compound of all those weapons, systems and effort which have been devised or improvised to oppose invading aircraft.

When I hear loud talk of the effectiveness of anti-aircraft artillery I always think of this homely example so apropos, so much in point. A farmer there was whose herds and flocks were molested by prowling wolves. This thrifty fellow procured a big dog and tied him in the barnyard at night. At first this was ample protection; at first the wolves stayed at a safe distance. Eventually, however, they learned that they had nothing to fear from the dog beyond a certain range, so they preyed upon hapless flocks and herds beyond the confines of the barnyard. They learned that there was no bite behind the bark. The farmer then released his dog so that he could pursue the wolves. That solved his problem. Now, putting cannon around a bridge or a factory to protect it is like chaining a dog in a barnyard. Hostile bombers soon learn at what altitude they can attack in safety, or from what direction they can approach with least interference.

The only way to defeat those invading airmen is to send something after them which can catch them; which can pursue them and engage them whenever and wherever encountered, preferably long before they have reached a point where they can deliver their bombs.

The best anti-aircraft cannon have wings on them; they have the speed of airplanes; they are in airplanes. The best anti-aircraft defense is the fast, fighter airplane. It is never good military strategy to sit and wait for the enemy to come to you. It is always best to take the offensive. Only airplanes have that power against other airplanes.

Then, there is that ever present matter of economy. It never will be possible to build enough ground-based anti-aircraft cannon to protect all the cities, bridges, rail lines, factories, and other vital war industry establishments in this or in any other large country. It is much better to give your anti-aircraft guns the mobility of aircraft, so that they can move at 200 miles or more from one threatened point to another; so that they can defend Washington now and New York City an hour later. Mobility is one of the biggest words in the lexicon of the military tactician. Only the airplane has the mobility of the fastest weapon which the enemy can bring against us.

I do not say, however, that ground-based anti-aircraft cannon and machine guns should not be supplied. There are conditions where they will be useful. They can well be used to supplement other forms of defense. Just as there will never be enough guns for complete protection, so also will there never be enough airplanes. Both are needed and both must be provided. I do say that we should never allow ourselves to be deluded into the belief that ground-based cannon are ample for anti-aircraft defense, nor that they are the best form of defense against invading flying machines. They are neither. Their limitations are serious and those limitations must be understood and our plans must recognize those limitations.

A proper anti-aircraft defense will endeavor to hunt out the enemy's air bases, be they airplane carriers or flying fields, and to destroy the planes before they are launched against us. A proper anti-aircraft defense will also provide ground-based guns and fighter aircraft for station about the more important of our installations. It will provide ample and extensive alert nets to warn both ground and aircraft crews of the approach of enemy flyers. These active measures must be supplemented by definite and positive passive measures. Everything which we cannot possibly afford to lose must be placed underground; those installations which cannot be operated underground must be camouflaged; we must learn to operate all trains and truck convoys during hours of darkness. The workmen in our munitions factories must be trained and schooled to systems of rigid air raid discipline. Our civil populace must be taught definite procedures so that panic will not seize them when the whining drone of enemy airplane propellers is heard overhead. All methods and weapons of defense must be integrated into one system and put under a single commander in any one area. Then, and then only, shall we have a proper air defense. Such a defense will be a prerequisite essential to any nation which would hope to survive any modern war of major magnitude.

* * *

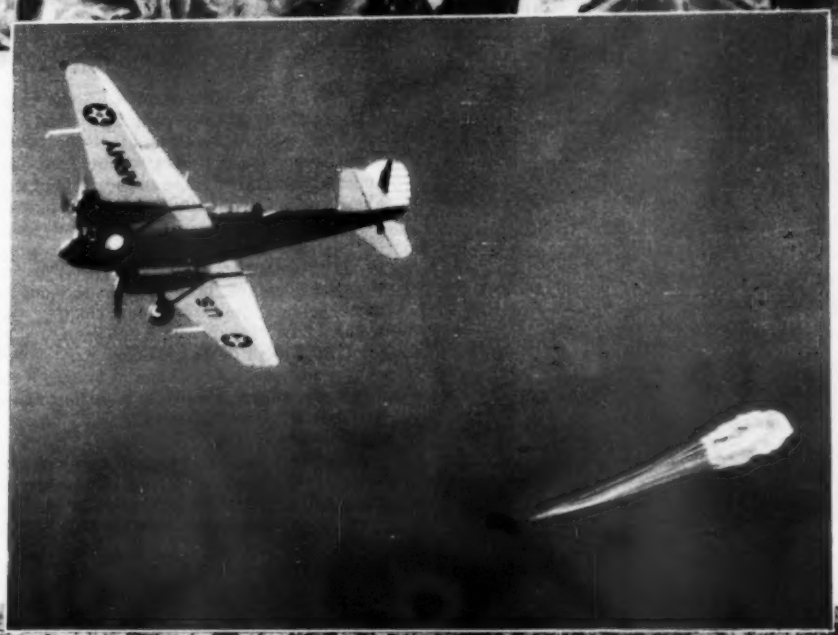
Author's Note: The opinions expressed herein are my own and intended in no way to express the views of the War Department or anyone else in the military services.

JAMES E. FECHET.

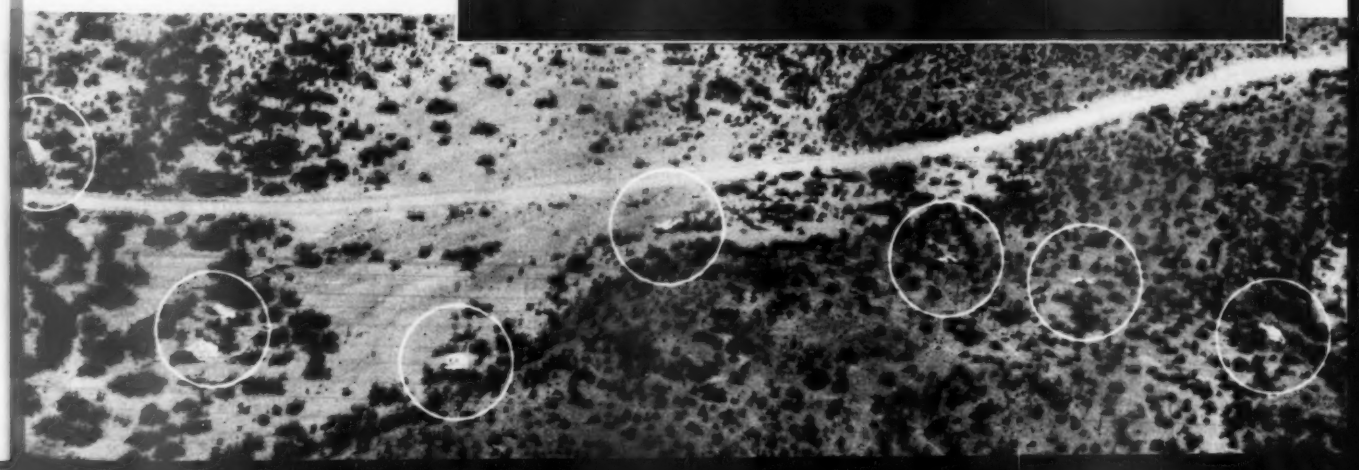
END

A well-placed bomb from a dive-bomber could cripple this carrier's operations.

8 CANS OF Applesauce



TWO eggs out of four dozen were cracked. One parachute out of 20 failed to open. Otherwise the food, hay, grain and wood dropped recently to an isolated cavalry platoon of 30 men and horses near Balmorhea, Texas, were delivered intact. The delivery van was an Army Martin bomber. The occasion was the testing of aircraft as a means of supplying food to Army units cut off from ground aid. Hence, the cavalry unit was considered completely isolated and the airplane its only source of supply. Being in mountainous country, the aircraft used parachutes to drop supplies. One day's "delivery" was typical: hay, 490 lbs.; oats, 300 lbs.; wood, 200 lbs.; applesauce, 8 cans; bacon, 9 lbs.; corned beef, 12 lbs.; bread, 32 lbs.; butter, 3 lbs.; eggs, 4 doz.; ham, 14 lbs.; potatoes, 20 lbs.; onions, 5 lbs. 36 oranges, coffee, 4 lbs.; corn, 6 cans; jam, 2 cans; milk, 8 cans; peas, 3 cans; tomatoes, 3 cans; corn, 6 cans.



HOW DID

"... the Jenny would drop off into a spin if you egged her on. She did pretty well ..."

by T-2003

We'd always wondered about those old crates. So we hope you enjoy this yarn as much as we did. It's not often you find an old-time peelot capable of writing it down.

YOU first see the picture. Some ship that has probably long ago given up the ghost. "I can build that one," you say. So you get the plans and the material and you clear your table or bench, and go ahead. You build it, and color it and fondle it, and hold it off and admire it, and your friends admire it one and all, and the rest of the family also, and you repair this or that delicate wire broken from too much handling and then someone remarks, "I wonder how *that* one flew. What did the pilots say about it, d'ye think?"

You answer, "I don't know, I wonder too. But golly, y'know *I'd* like to have flown the real article. I really would."

Well, would you?

Let's see what the pilots had to say about some of the old time crates. Dope taken right from their pilot log books, or gotten from their remarks and sundry other judgments concerning the crate in question.

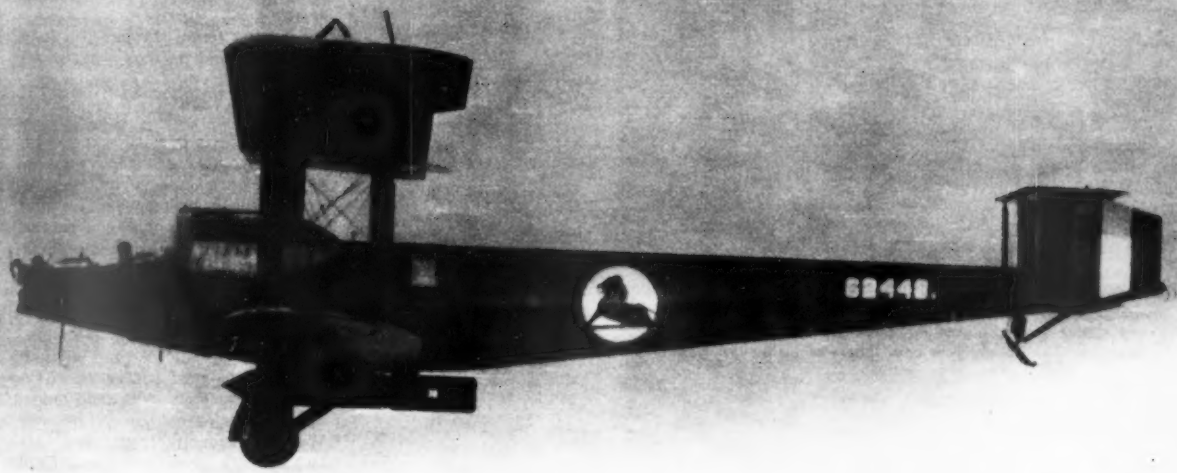
Dope you can put on the nice white card with your name on it and the name of your model when the latter is exhibited at your home or elsewhere. Here it is:

Standard "A" with four-cylinder vertical Hall-Scott

A fire trap, the worst of them all. Built high off the ground. Set one down a bit hard and it would bounce a half mile in the air. Then you'd give it the gun but the engine wouldn't take it and she'd flutter down to earth—the fastest flutter you ever saw, until you came to, fighting fire or pushing the splinters away from you. That is, those splinters that weren't stuck into you. The old four-cylinder Hall-Scott (about 100 horsepower) was the vibratingest thing on earth or above it. Early in June 1918 the Army ditched these Stand-

Wonder what today's Flying Fortress pilot would think of this ancient Martin bomber?

THEY FLY?



This Handley Page was no racer. But she did right well with that 4000 lb. bomb.

ards and adopted the Jennies.

Curtiss JN4D with 8-cylinder, V-type OX5 engine

Didn't they look racey after those old Standards? Built close to the ground. Acted so consistently, too. However, you kept your nose down on the horizon in the turns because she *would* drop off into a spin if you egged her on. But strong and sturdy. You tried real power nose dives, inverted gliding and snap(?)rolls. And did them pretty well. The engine was a cinch to repair when you were stuck miles from nowhere with, say, a busted valve. All the works were on the outside and fairly accessible. That Jenny sure lasted a long time in the service.

Curtiss JN4H with Hisso engine

That Hisso did make a difference after the old OX5. Why, she seemed to land faster. Up in the air you could hold her nose up on turns and pull her around to your heart's content. But coming in to land —you couldn't neglect the throttle. Didn't let the coffee grinder cool off too suddenly in a long glide. No sir; you'd have some warped and blown valves if you did and *that*, my boy, meant a bawling out for somebody, generally the pilot, by the engineer officer.

HS2L seaplane with Liberty engine

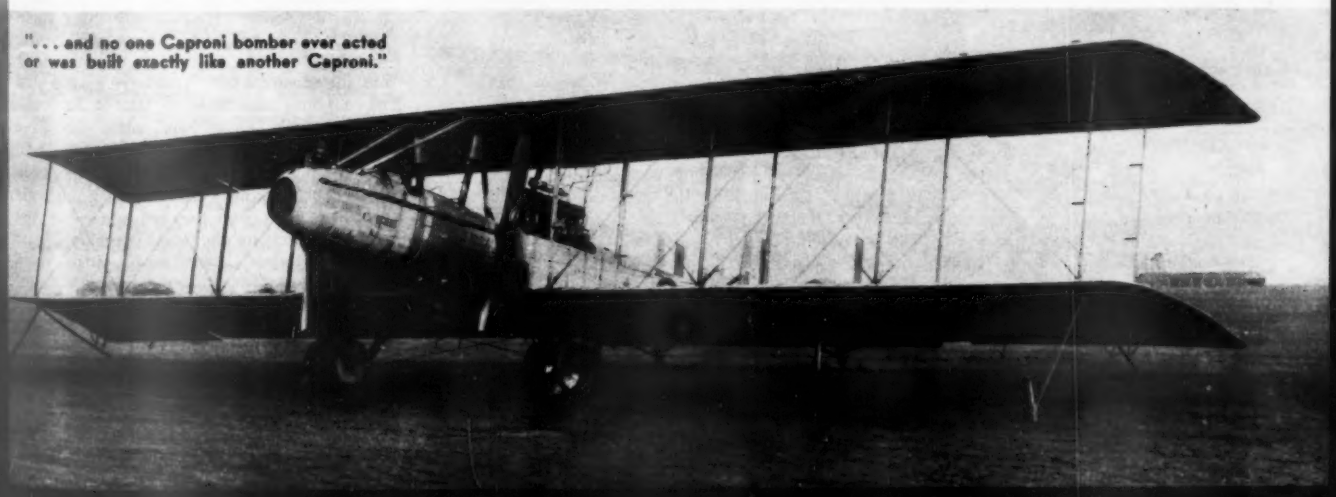
You get ready to land. Only you don't land on land, you land on water. You cut the gun. Does she nose down? No sir, she noses *up*. It's the pusher engine and prop that does it. And if you smack the H_2O too hard, make out the observer in the bow cockpit doesn't take a hammering. Once a pilot looped one—and got away with it. Some others didn't.

F5L seaplane with two low-compression Liberty engines

There *was* a brute. Weighed almost seven *tons* with full tanks and capacity load and only an expert could take her off with such a handicap. Best take-off on a breezy, ripply day. Even then it was great for developing the muscles to wrestle with the control wheel and rudder. But that deep "V" hull made her land easy. Just sliced into the water. Believe it or not, the *Army* had a fleet of them at Langley Field after the World War.

DH4 with Liberty engine

Mention the DH and someone says "flaming coffin." Right-o, particularly the DH4A with the pilot way up under the center section and the gas tank between him



"... and no one Caproni bomber ever acted or was built exactly like another Caproni."

No matter what some of the boys say about the old Nieuport, many a veteran World War ace flew to glory in one. She was an air-going polo pony—and fought like one.

By and large, there's a soft spot in the hearts of Army men for the Hawk (above).

"You could fly SE5's all day without tiring. But on the ground she was a holy terror."

and the observer in the rear. The "B" wasn't so bad, except you had to hold right rudder while flying, which got mighty tiresome on a long trip. The DH was a ship you had to fly, on take off and in the air; and in landing you sure had to watch it. None of your nose-high floating-in tricks with that baby, or off she'd fall and—smack-o.

Like the Jenny she lasted a long time in the Army, and did her best.

Martin bomber with two Liberty engines

Apologize all you want, old Martin bomber, you were a good jaloppy in your day and age. Not perfect, but what ship was in those dark ages? Lumbering, ungraceful and slow, but you carried bombs. Landing, especially in gusty weather or on a dark night was no joke. Get a wing down and the pilot needed a jolt with that motor to pick it up level. One pilot did wing-overs. Fine. Then a spin. Great. Then a loop. Another and another. Swell. The ship groaned and ached in every joint but held together. Then he landed, taxied up and stepped out, the props still turning. Walked around front too close and "whang!" a prop got him. Cold. They used to say the ship was almost human.

Caproni bomber with three low-compression Liberty engines

Lots of pep and power with those three Liberties, the center one a pusher. Took a big man and a strong one to handle this wagon. Some of the *smaller* American flying cadets sent to Italy with La Guardia to fly these Capronis during the World War had to be transferred instead to the pursuit school at Issoudun, France. She would have been a good bomber, except for one thing,—there was no place on or in her to carry bombs in a satisfactory way. And *no* one Caproni ever acted or was built exactly like another.

Handley Page bomber with two low-compression Liberty engines

They called it the "Galloping Goose." No power, although it would get into the air quick enough. A pretty good bomber, where speed didn't count. Maneuverable and controllable like a steam roller in a forest. A brute to handle in bumpy air. Allee samee, she carried the Army's first 4,000 pound bomb.

Thomas-Morse Scout with rotary engine

You listened to the gang who'd already flown the Scout. Hair-raising tales you'd heard. Then the instructors with their warnings of "Do this, don't do that, look out she doesn't, etc." You were scared stiff when your time came to take it in hand. Only it took *you* in hand when you gave it the gun. Away she'd buck. Up she'd shoot. Tail-heavy as a duck, the stick nearly broke your arm. Watch the air mixture. Cut out the ignition with the coupee switch on the stick occasionally or she'd overheat. Careful on the turns, she'd want to roll over and spin in, on account of the terrific torque set up by the rotary engine with its revolving cylinders. If you lived through it you knew you were good—or lucky. But you never felt easy in the

crate. Mostly because of the tales you'd heard, half of which were almost true. The LeRhone rotary used castor oil. The pilot didn't need it.

Nieuport "27" with Gnome monosoupape rotary engine

Take all the hard words said about the T-M Scout, load the Scout up with machine guns and ammunition, make it heavier, give it more power, stick a pilot in the cockpit and tell him to go out and fight. That's the Nieuport. A tough one to fly, but once mastered it would do almost everything at the bid of its pilot. You don't use a truck horse to do a polo pony's job, do you? Well, the Nieuport was a high spirited polo pony, acting best only high pressure.

SE5A with 180 h.p. Hisso

There *was* a honey—in the air. Light, easy to control, felt like handling a feather. Comfortable. You could fly the SE5's all day long without tiring. Not so good pulling out of a long dive with an enemy Fokker on your tail. Sometimes the wings would say "good-bye." And the tail group went "bang" when you did a split-S. On the ground, a holy terror in a cross wind or a gusty one on account of its lightness and big dihedral. Once at Kelly Field in 1921 a whole formation went over on their backs while taxiing out. Nevertheless, the pilots loved the SE5A—but only for playing around.

Spad XIII with 220 Hisso

Heavy like a ton of lead. Strong like an ox. Fly 'em wide open. Pull them up, slam 'em around. A fighting ship for fighting men. (But awful to maintain. The mechanics didn't like *that* one.) Landed fast. You dove her for the ground and levelled off four feet high and sailed across the field at 100 miles per hour.

Curtiss "Hawk" with 12-cylinder Curtiss D-12

More Hawk models have been built than any other model, I reckon. Doesn't that show what sweet lines she had? Sturdy, too. Fast enough, for those days. You could do anything with that baby. She flew like an airplane should. No tricks, mean or unexpected, ever cropped up. Coming in over the hangars you'd hold her nose up and slip a bit to let her glide slowly as she would pick up speed, pronto, when the nose got down. The Army called it P-1-B, but we'll always know it as the *Hawk*, won't we?

Of course, these are just a few of the old babies that recall fond (and sometimes shuddering) memories. I know there are probably plenty of old-time pilots who have other thoughts about some of these ships. But generally speaking, I think you'll find most of the boys think the same. Most of the old crates were designed and built more on the spur of the moment than anything else. The chances are that the designers and builders were just as surprised at the things their finished products did as were we who found ourselves stranded in midair with those ships. But, inasmuch as we're still alive, those old babies bring back memories, all right.

END

The Standard was the worst of them all. She was a fire trap, the engine would quit when you needed it most. She'd burn at the drop of a hat—or fill you with splinters.

The Spad (above). Heavy as a ton of lead. A fighting ship for fighting men.

If you lived through flying a Tommy-Morse you were lucky. Or an extra good pealot.

When Robert Wadlow, Alton, Ill., giant (8 ft. 7 in.) flew to New York City not long ago, the airline had to remove two seats to accommodate his 450 lbs.

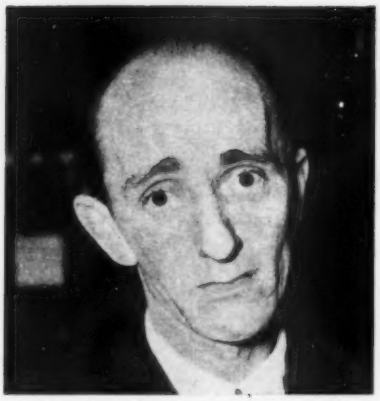
Wealthy sportsman-racing airman Frank Fuller has been named "chief pilot" of San Francisco's 1939 World's Fair.

Personalities

This is "Snow White" in the flesh. The voice that has captivated so many Walt Disney fans was supplied by Miss Adriana Caselotti, snapped above aboard a United Airliner.

When Carl Stengel of Gainesville, Fla., slashed dual instruction charges on his three ships below solo, he soon found that bargain prices can boom his business.

So versatile is Gordon Shook that Braniff Airways has named him "honorary pilot."



Derek D. Dickinson flew in Spain, claims he air-dueled young Mussolini to a draw.

Robert H. Fatt was one of Pan American's first pilots, has spent five years aloft.

Major-General Oscar Westover, Air Corps chief, spent Army Day in Akron, O., at the home of Ray Brown, tire company air official.

Miss Evelyn Sharp, 18, of Ord, Neb., learned to fly at the Lincoln flying school, is Nebraska's youngest girl pilot. She never flies without "Scotty."

United Airlines thinks Miss Lucille Zihlman (a United stewardess, of course) has ideal measurements. She is 23, height is 5′ 4″, weight 112, bust 33, hips 35, waist 23, shoes are size 6.

This is Airclown Mike Murphy taking his afternoon siesta on the veranda of his Cub. Murphy specializes in air-comedy, spends much time flying planes off auto roofs.

This big biplane may carry anything from onions to corpses.

The HANDY LINE

by GEORGE R. REISS

Those islands out in Lake Erie do business by air. Milton Hersberger and his airplanes see to that.

"THIS trip, we've got 100 loaves of bread, a case of lettuce, two bundles of magazines, four storage batteries, a crate of automobile parts, four kegs of beer, a box of oranges, a case of dry goods, a box of drugs.

"And coming back, you've got to pick up that dead man in the coffin and the undertaker at North Bass; 20 cases of wine at Middle Bass; and 30 boxes of fish and two passengers at Put-in-Bay, and . . ."

That might be the freight clerk instructing a pilot of the Erie Isles Airways, that unique little — and virtually unknown — freight mail and passenger airline that has removed the perils and discomforts and loneliness of long winters for the thousands of residents of the scattered, spray-washed Lake Erie islands.

Cases of oranges aren't at all unusual in this plane's cargo.

And it has built up profitable winter businesses for the islanders who formerly lived in payless leisure during the lonely winter months, shut off for days at a time from the mainland hospitals, newspapers, stores, doctors, undertakers, and theaters; and, incidentally, it built up a nice profitable business for the airline.

Today, the Erie Isles Airways' fleet of planes daily carry more passengers (at $1 or $2 each) than do some of the better-known airlines; and its planes fly with some of the most unusual air cargoes seen on the continental United States—livestock and live poultry, rare wines, fish, automobile parts, medicines, fresh produce, baked goods, books, magazines, newspapers, mill machinery, wearing apparel, beer, virtually anything and everything.

This line's fleet of planes—including two Ford tri-motors, two Aero Transport tri-motors, and two single-engined New Standards—fly thousands of miles monthly, yet they rarely make a non-stop flight even as lengthy as 25 miles, except on special charter trips.

And the line has hung up a record for dependability and safety for the big airlines to shoot at—a record of eight years of operations with only three scheduled trips missed, no matter the icing conditions, the blizzards, the fog, the high winds.

The Lake Erie islands are a scattered group of some 15 or 20 islands, ranging in size from about half as large as a good-sized Ohio county down to tiny wave-swept reefs from which sprout only a few hardy trees. They are scattered from a half dozen to about 20 miles off the mainland in Lake Erie near Port Clinton, Ohio.

They include the Canadian-owned island, Pelee, the largest of the group; Kelley's Island, with its huge limestone quarries, and a permanent population of about 700; South Bass Island, with a permanent population of about 250 and the historic village of Put-in-Bay and its beautiful memorial to Commodore Perry of the War of 1812 fame; Middle Bass with about 200; and North Bass with about 150 permanent residents.

Then there are the tinier islands, Rattlesnake, Gull, Ballast, Hen and Chicken, the Sister Islands and others.

In summer, the island region is a fairyland, one of Ohio's favorite vacation resort regions. Thousands of vacationers flock to the islands or nearby mainland resorts to bathe and fish and occupy the summer cottages. Large lake steamers bring crowds from Detroit, Cleveland, Toledo, while smaller steamers ply regularly between the islands and Sandusky, or Catawba.

Private sailing vessels and cruisers and even big steam yachts from all over the Great Lakes lie at the docks and sheltered coves of the islands. Big cargo steamers, sometimes, come to the islands, to move out great cargoes of limestone for the lake front blast furnaces. The islands too are dotted with fine peach orchards and vineyards, some of the finest in the country.

The permanent population consists chiefly of quarry workers, keepers of the vacation resorts, orchardists and vineyard owners; commercial fishermen, and governmental employes.

But when the vacation seasons ended, the islands went into virtual hibernation in bygone years. Vacation resorts were closed, the quarries ceased their work; commercial fishing had to be stopped, for there was no market for the fish, the wineries were closed, and all boat service to the mainland ceased.

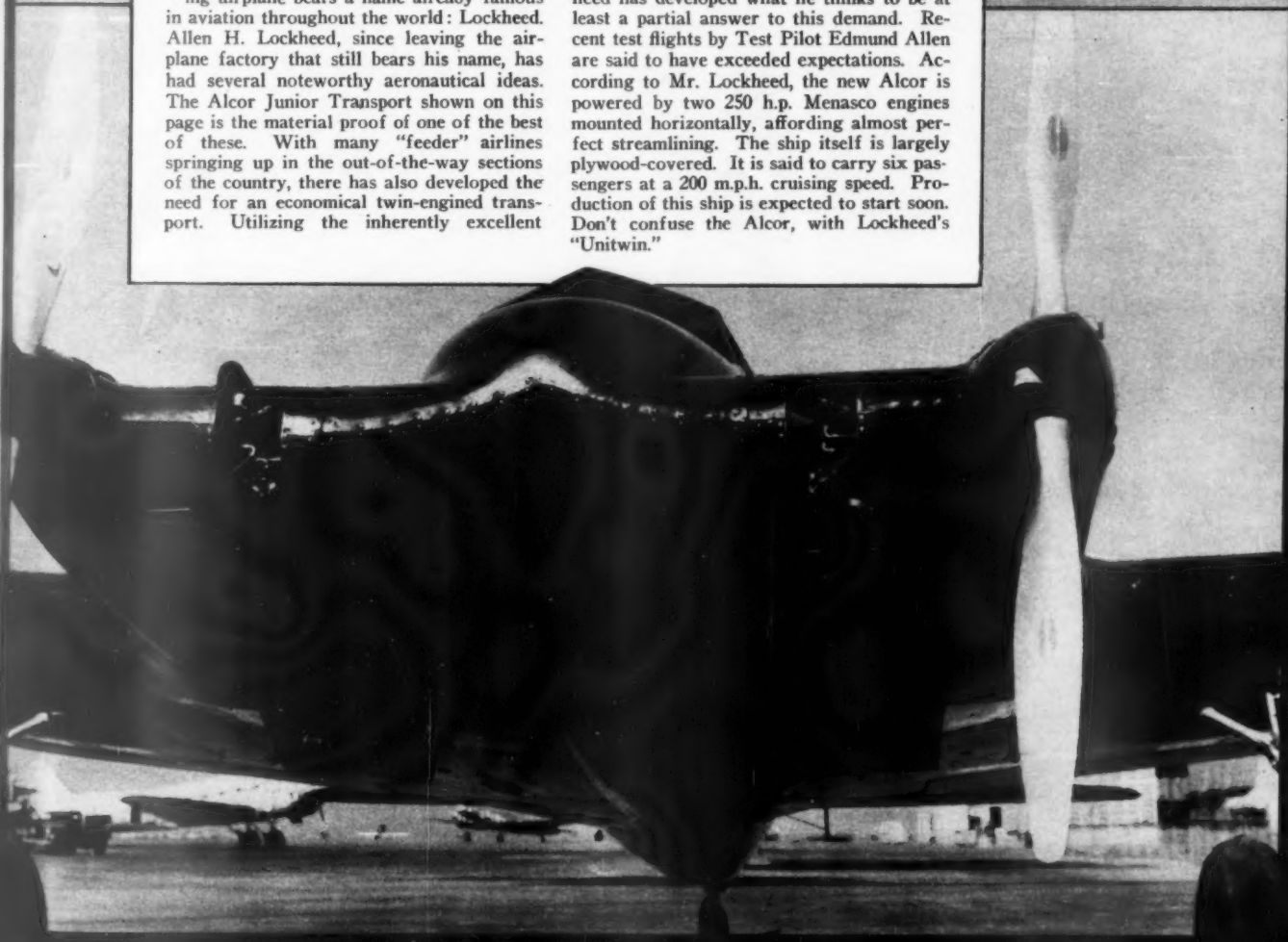
In the old days, the hardy islanders at-

(*Continued on page* 87)

When Milton Hersberger found his novel airline needed a weight-carrier, he dug up this trusty Ford.

"JUNIOR..."

THE man who designed this unusual-looking airplane bears a name already famous in aviation throughout the world: Lockheed. Allen H. Lockheed, since leaving the airplane factory that still bears his name, has had several noteworthy aeronautical ideas. The Alcor Junior Transport shown on this page is the material proof of one of the best of these. With many "feeder" airlines springing up in the out-of-the-way sections of the country, there has also developed the need for an economical twin-engined transport. Utilizing the inherently excellent streamlining of the in-line engine, Mr. Lockheed has developed what he thinks to be at least a partial answer to this demand. Recent test flights by Test Pilot Edmund Allen are said to have exceeded expectations. According to Mr. Lockheed, the new Alcor is powered by two 250 h.p. Menasco engines mounted horizontally, affording almost perfect streamlining. The ship itself is largely plywood-covered. It is said to carry six passengers at a 200 m.p.h. cruising speed. Production of this ship is expected to start soon. Don't confuse the Alcor, with Lockheed's "Unitwin."



WAR HEN

The "cackle" of this Boeing XB-15 would send an enemy scurrying to avoid its tons of deadly eggs.

The "cackle" of this Boeing XB-15 would send an enemy scurrying to avoid its tons of deadly eggs.

The photograph at the right shows the XB-15 about to land.

THE LATEST IN KILLERS

Boeing engineers have designed some of the deadliest warplanes on earth. This latest XB-15 is so potent that only a war could show its true might.

IN many issues of POPULAR AVIATION we have had to call newly-developed warplanes "deadliest", "mightiest", "most devastating" and a few other mild descriptive terms that might be construed as meaning that particular airplane is really *something.*

This time we're stumped.

Boeing's latest bomber has been successfully test-flown and, well, we used up all our "deadly" words on the XB-15's baby brother, the B-17 or *Flying Fortress* as it is popularly known. In reality, though, this new XB-15 makes the B-17 look something like the latest Douglas sleeper-plane would make the old trimotored Ford look like. That's a little exaggerated, of course, but basically we're pretty close to being right.

Seriously, though, about the only way we can impress you with what this newest Boeing bomber is like is by drawing you a few word-pictures. First, however, let us caution the typical eagle-eyed reader of POPULAR AVIATION. Though the XB-15 is newer than the B-17 and B-18 (Douglas), it bears the serial number which ordinarily would classify it as being older than the latter two ships. Theoretically, this is true. The XB-15 was designed before the B-17. Due to the tremendous engineering excursions into the unknown, however, the XB-15 has been held up until only recently. Hence the number mixup.

Now—fully loaded with bombs, crew, fuel for *6,000* miles and an awe-inspiring array of armaments, the XB-15 weighs *30 tons:* 60,000 pounds! That's equivalent to 62 fully loaded Piper *Cubs;* 16 fully loaded Stinson *Reliants;* 2½ fully loaded 21-passenger Douglas airliners; 11½ Curtiss P-36 fighters—or 352 men who weigh 170 lbs. each!

With its 6,000-mile cruising range, the XB-15 can carry its load of sudden death from San Francisco to New York and back to Chicago *without stopping.* At what speed this flight can be made is your guess. We do know, though, that the XB-15 has a bit better performance than the B-17—and B-17's have flown from the Boeing factory at Seattle to the east coast at speeds something like 230 m.p.h. Naturally, the XB-15 is the biggest bomber ever built anywhere. Wing span is 150 ft., the length is about 90 ft. The ship has living quarters for its crew of eight men.

The XB-15 is so large that the ordinary aircraft electrical system could not be used. Consequently, this gigantic new bomber carries a complete 110-volt electrical generating system that is run by independent gasoline engines carried in the ship. These were specially designed.

Nowhere on this aerial battleship could an attacking airman find a blind spot.

Shot Down in Spain

The war in Spain is no child's play, especially in the air. Both the engine and airplane shown here were of German manufacture. The engine (left) has the long propeller hub with a cannon in the shaft.

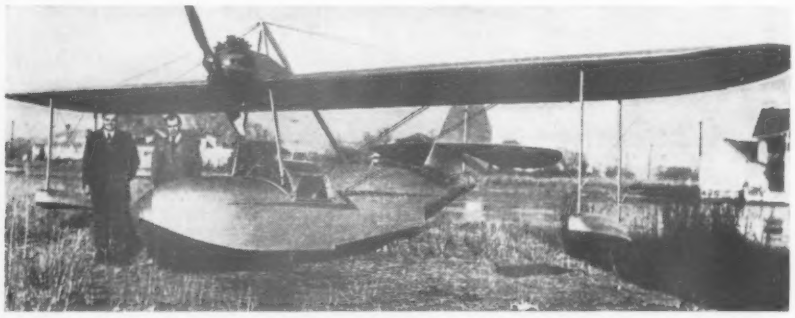
THE above photographs are partial proof that the Spanish war is not being fought by Spaniards alone. Not by any means; so many reports from first-hand witnesses have told of whole squadrons of German and Italian warplanes fighting in Spain that it would be impossible to discredit them all. Not only that; there is proof that the pilots of those airplanes are not entirely Spanish. Nazi and Fascist airmen are seeing extensive "service" in Spain. As pointed out in recent articles in POPULAR AVIATION, Spain literally is being used as a proving ground for new war materials. It is reported that, after a new type fighting or bombing plane has seen a certain amount of service, it is withdrawn from Spain and a newer design substituted. It would be interesting to know the cannon-engine's results.

A Baby "China Clipper"

NO fooling about the little boat below! She's a real, flyable airplane, was designed and built out New York-way by Gilbert Trimmer (left) and Louis Purchase (right). They call their design the *Trimcraft*.

The *Trimcraft* is powered with a 40 h.p. Salmson air-cooled engine which has given her fairly good performance in test flights. Top speed, according to the builders, is 93-100 m.p.h. She's supposed to cruise at 85 m.p.h.

To all outward appearances, at least, the *Trimcraft* should make an ideal sport ship for persons living on or near water. The ship (it had not received its Approved Type Certificate from the Bureau of Air Commerce at this writing) carries two persons comfortably side-by-side. Fully loaded, it weighs 1,100 lbs. The wing's span is 37 ft., while the length is 18 ft. Here, then, is another example of the kind of work and the ingenuity shown by ambitious home-builders.



I Hate Stunt Flying

by Archibald Black

IT began around the time of the World War. That is, not the stunt flying but my dislike for it.

I used to do quite a fair amount of flying with a very likeable pilot whom we called "Blake." That wasn't his real name but what he was affectionately termed by those who knew him best. Blake tested the ships that I designed and we developed a close friendship and each a respect for the other's ability in his part of the work.

I had a lot of respect for Blake's ability as a pilot and, judging by what he put my ships through, he must have had an equal confidence in my engineering calculations. We flew together when occasion permitted, which was generally in some kind of test flight.

We even established what was probably a short-lived two-man altitude record by attaining some 18,300 feet. For these days that was quite some height but in the hectic days of the War records were made and broken with but little notice and we were too busy with more important work to strive for any publicity. Which is, perhaps, more than could be said for some of the subsequent acquisitions of the industry.

Well, everything went along smoothly until Blake visited the Army flying fields in Texas about 1918. This was just as the first batches of debutante pilots were going through "finishing school" and and they were doing *some* flying.

After good old conservative Blake stood on the ground for a time, watching loops and tailspins, the urge to go out and do likewise got into his blood. He returned to the north a confirmed stunter.

This discovery came upon me like a bolt from the blue as I stood one day out on a Long Island field watching him put one of my ships through tight spins and loops. About five minutes of this evaporated most of my interest in occupying the front cockpit with Blake in the rear.

When he landed I pleaded with him, only to be good-naturedly joshed in return. Of course, it got worse. For stunting is a disease that has to run its course until it kills or is cured. All stunters end one way or the other. . . . Blake became one of the former . . .

It came on a bright, clear November day; ideal flying weather at that. He had a passenger who had never flown before and, therefore, had to be shown some "real" flying. One spin followed another, each being obviously an effort to pull the ship around tighter and hold her in longer. The last one was just a trifle too close.

They hit the frozen soil on the way out—the angle was not much over 20 degrees. Even 30 feet more might have been enough. The passenger died instantly; Blake, as soon as he reached

(*Concluded on page 76*)

"Not a day goes by in the north country without an airplane carrying a sick or wounded man or woman to medical aid. . . ." Many lives have been saved in this manner.

TO THE RESCUE!

by EDWARD GREEN

Airplanes have done much more important things than carry bombs. Mercy flights in wild northern Canada are common.

TWO men, their bodies chilled blue by the biting cold of high altitudes, crouch in an almost inaccessible spot on the west coast of Vancouver Island. They are weak from hunger and almost exhausted from exposure. If help does not come soon they will die.

But where can they look for help? They have trailed over mountains and down into little known valleys. They are a few miles from the coast, but no one knows just where they may be found. It would be folly for anyone to start searching for them on foot.

Luckily, their absence has created some discussion in a small fishing village on the coast. Bits of conversation are pieced together and it is soon apparent to the people of the village that something has happened to the two men. They send a call in to Vancouver and soon, "Ginger" Coote, British Columbia's famed "mercy flyer" is on his way to search for the lost men.

Ginger located them crouched on the side of a mountain. He knew it was impossible to land there so he returned to the village and gave instructions as to how the men could be reached. Rescue parties were organized and after a heroic struggle, the two men were carried out to safety. Had it not been for the airplane they would have perished.

With aircraft spreading death and destruction in China and Spain, it is comforting to know they can also save life on this continent of ours. Joe Crosson, the famed Alaskan flyer, is well known for his "mercy flights".

The annals of northern flying are filled with "mercy flights". The logs of Arctic pilots read more like the call sheet of a busy city ambulance. Trappers and prospectors are continually getting into difficulties and the airplane brings them out of the wilds to the hospitals.

At Keg River, in rugged British Columbia, a trapper was pushing his way through some thick brush. His gun went off and a charge of shot almost tore his jaw away. He managed to get back to his cabin where his partner did all in his power to make the injured man comfortable.

But it was a losing fight. The partner soon saw that unless he secured medical help his companion would die. He was two hundred miles from help of any kind, but he had to do something. He went outside and hitched up his dogs and was about to start on his long journey when he thought of a young chap who was experimenting with a radio transmitter a few miles away. Racing beside his straining dogs, the trapper's partner soon reached a tiny cabin set deep in the woods.

In swift sentences, he told the young fellow of his predicament. The amateur operator sat down to his set and began sending out his call letters. He soon received a reply and within a few minutes the call for help had been answered. An airplane would be sent at once.

Three hours later an airplane, piloted by the famous "Wop" May, brought out the injured trapper and carried him to hospital where his life was saved.

Individually "mercy flights" are too numerous to record. Not a day goes by in the north country without an airplane carries a sick or wounded man or woman to medical aid.

While this is being written, Ginger Coote is squatting down in a small bay on the Pacific Coast waiting for the weather to clear so that he may proceed with a doctor and a patient. The patient is an old man who was stricken with penumonia in a small coastal town. Ginger is bringing him in to the city hospital where he will be well taken care of.

But not all "mercy flights" are simple pickups. There are times when a "bushed" (crazy) trapper or prospector must be brought out in a straight jacket —if one is available. If not, then the pa-

The trapper below was picked up following an emergency call and flown to medical aid. The ship is an American Fairchild "71".

Badly injured, the man below was flown out of the "bush" by a "mercy pilot". Note the hospital ambulance in the background.

tient must be strapped to a plank. This happened far up the Mackenzie River when a Mounty went in to bring out a crazy trapper.

The plane was proceeding on its way with the Mounty and his patient, seated side-by-side. The patient was normal and everything seemed to be all right. Suddenly the patient became violent. The Mounty tried to pacify him, but it was no use. The man began to smash the walls of the plane. The Mounty soon realized he was in for a fight.

Luckily, there were two prospectors aboard, but the three men fought for more than two hours before the crazed trapper was finally subdued and strapped to a plank. Tired by their efforts, the three men flung themselves into their seats as the plane roared on.

But they were not to be permitted a rest. The trapper, possessed of the strength of ten men snapped his leather ties and fought savagely once more. Up front, the pilot was helpless as he heard the sounds of battle. His plane was pitching and yawing as the center of gravity was swiftly changed by the battling men. He must find a place to land.

Fortunately, he was able to get down on a small lake and no sooner had the plane's skis touched the ice than the fight ceased. The insane man quieted and once again the Mounty lashed him to a plank. But this time he took no chances. He wrapped him in several feet of tough rope in addition to placing his handcuffs on the man's wrists and fastening them to the plank. The trip was completed without further incidents.

But Captain Jeff Home-Hay of the Arrow Airways at Le Pas, Manitoba, didn't have such a pleasant ending to his adventure with a crazed Indian in mid-air. Jeff was flying alone and when the Indian came aboard he seemed quite normal. Jeff placed him in a cabin chair and took off for Le Pas.

No one will ever know what happened to the Indian. The first intimation Home-Hay had that anything was amiss was when a terrific crash sounded against the thin wall between the cabin and the cockpit. Jeff turned and glanced into the cabin. He found himself staring into the bloodshot eyes of the big Indian.

Jeff instantly recognized the signs of madness. He was in a desperate predicament. He knew the Indian was trying to get into the cockpit. He glanced below was a landing place. There was none. Nothing but muskeg below. Jeff resolved to try and reach Le Pas a few miles away.

By now, the Indian was more violent than ever. He smashed at the cabin walls and began tearing strips of fabric from them. He struck at the thin plywood partition of the cockpit and tried to reach the pilot. Jeff sat tight. The Indian now began to throw himself around the cabin, wrecking everything he touched.

Suddenly, the Indian became quiet. Jeff glanced back. He saw the crazed

(*Concluded on page* 80)

Caught—750 Miles At Sea!

THIS unusual photograph was made during the recent Army Air Corps maneuvers along the Atlantic coast. The liner is the Italian *S. S. Rex* and was outward bound from New York City when "caught" and "bombed" 750 miles at sea.

It was a worried Italian skipper that radioed up to the bombers as they dived out of the clouds toward the ship. The friendly Army pilots informed him he need have no fears and that they were merely using the *Rex* as a "practice target" on a reconnaissance mission during the recent war games.

The three Boeing B-17's were flown by Major Caleb V. Haynes and Captains A. Y. Smith and C. W. Cousland. Major George W. Goddard, famed Army photographer, made the above photograph.

The Flying Tree

The arrow points to the original flying tree on the dock just before being loaded aboard the old Curtiss flying boat. The tree later was planted and still lives there.

WE HAVE all heard of flying fish and flying squirrels, but it is doubtful if many of us have heard of a flying tree. You have probably guessed already that it had something to do with an airplane; and you are correct.

At 11 a. m. on May 4, 1926, an old Curtiss pusher type amphibian circled over Lake Mahopac in Putnam County, New York. The pilot glanced over the side, looking for an anchored rowboat in a cove of the lake. He had previously arranged to have a rowboat anchored in the cove so that he could tell, by the drifting boat, from which direction the wind was coming.

"Ah, there it is," he exclaimed, as he brought his head back under the protection of the windshield.

He landed the ship on the lake and taxied to a dock where he saw several men waving to him. After the plane was tied to the dock the pilot stepped out and exchanged greetings with the men who were waiting. Then the whole group left to attend to business and to have lunch.

(*Concluded on page* 85)

The MAN UNDER THE HOOD

By D. W. W.

THEY don't spin really big airplanes any more as part of their acceptance tests. . . there's too much money at stake, and besides their stability and wind tunnel tests generally are considered ample. . . but an Army Air Corps crew of five from **Langley Field,** a couple of weeks ago, unwillingly and unintentionally proved that the four-engined **Boeing** B-17 *Flying Fortress* bombers can recover from a prolonged spin as well as smaller ships. . . the boys admit they straightened out kinks in their hair—among other things—while doing it. . . .

It seems one of the big jobs was up on endurance test (1,700 gallons of fuel in tanks at take-off) . . . they'd been up for about five hours, flying at reduced throttle and mixture and still had 1,100 gallons sloshing around their tanks when they got their thrill . . . stalling along at 100 m.p.h. at 14,000 feet with the Sperry gyro-pilot in control, the bomber suddenly let go and began to spin with a fury . . . everybody was surprised and plenty startled . . . all the more so because they spun right into a thick overcast . . . after six turns and the loss of about 9,000 feet—you can see that one of those 45,000 pound airplanes really uses up some space in a spin—they got the robot pilot disconnected. . . then went through the old 1-2-3 procedure on instruments to recover . . . to the surprise of everybody aboard the big baby responded perfectly . . . coming out within one full turn . . . the pilot's eyes popped when they saw the air speed go up to 280 m.p.h. with all that load before they could get the nose up out of the recovery dive. . . when they succeeded they found themselves underneath the overcast with 4,000 feet still between them and the ground. . . they've a lot more confidence in the airplane after throwing it around at that speed and seeing the wings stay on.

* * *

Speaking of the **Army,** there's something about the **Air Corps** that's bothered us for some time . . . the recent maneuvers on the New England coast brought it up again . . . the First Pursuit Group was slated to take part . . . but suddenly their new **Seversky P-35** fighters were grounded . . . trouble with their *Twin Wasp* engines . . . what arouses our curiosity about that is how **Army** engineers seem to let such things happen . . . despite the fact that every airplane and engine is presumably thoroughly tested before ordering . . . it's taken for granted that, after going through the gruelling tests at **Wright Field,** any airplane purchased by the **Air Corps** is thoroughly proven . . . yet the **Army** has pulled several bad boners that the owners of that equipment—the taxpayers—should know about . . . if there are "bugs" in an airplane or engine what right has the **Army** to buy large batches of them? . . . after all you can't very well blame the manufacturer . . . military requirements are extremely high . . . and you have to pay for 300 m.p.h. performance and 1,000 h.p. engines . . . you always pay with safety . . now we want to know *why* this trouble with the **P-35's?** . . . and *why* the scandalous difficulties with the **PB2-A's?** . . . especially after Army officials tested, approved and bought that equipment in large batches . . . if either the **Army** or the manufacturers have anything to say, these columns are open . . .

"Wow! Did you see the expression on the old boy's face . . .?"

* * *

Although there has been no announcement about it, the **Navy** has given a good contract to **Grumman** for a mid-wing monoplane ship-board fighter (**F4F**). . . the wheels pull up into wells in the round fuselage just as they did in the **Grumman** biplanes and in the **Brewster** two-place fighter-bomber. . . it's the **Navy's** first venture into the monoplane field with fighters. . . remember, the **Navy** has to land its hot stuff on a heaving carrier deck, none too big a target at best. . . it means that **Grumman** has a pretty slow-landing monoplane. . . and monoplane fighters as a class are not leisurely in touching down.

* * *

I'm somewhat amused by the ruckus that seems to have developed in the aviation industry concerning my identity . . . the editors of POPULAR AVIATION tell me I have been "identified" at some time or other under many names . . . the most prevalent being that of my colleague, **Swanee Taylor** . . . so far, *no one* has guessed right . . .

* * *

Keep your eyes and ears open . . . there's liable to be a row of astonishing proportions soon . . . over the exporting of American warplanes . . .

* * *

Couple of weeks ago we saw a gadget the **Sperry** people have had abroad the China clippers that fly the Pacific. . . it's a north-pointing gyro-compass. . . the usual directional gyro will point more or less accurately in any direction it is set. . . but this one was hooked up with an aperiodic compass. . . . and it always points north. . . it's really something. . . the balance and steadiness of the gyroscopic instrument with the direction-finding capabilities of the needle sensitive to the earth's magnetic currents . . . **Sperry** has had three or four of them out for some months . . . they're still experimental.

* * *

Incidentally the **Kollsman** instrument folks have a new turn-and-bank instrument that should be a honey for private owners and for charter and other airport operators. . . instead of a metal gyro that must be perfectly machined and balanced and hung on wonderful bearings to operate efficiently, the turn-indicating element is a fluid. . . I didn't understand exactly how it works but I saw it proved that it really does. . . it's simple to manufacture, and needs almost no maintenance. . . it should be (but probably will not) sold at a price far

below the other turn and bank jim-cracks.

* * *

We'll still stand on our note about the possible folding of the **Air Line Pilot's Association.** . . and we're sorry to see events shaping that way too. . . but here's another bit of gossip on the A.L.P.A.—**Dave Behncke,** the doughty president, *may* find himself pushed out of his job. . . there's a faction within the organization working that way. . . here's a friendly warning, Dave.

* * *

Definitely this is out of its place in the column but we want to get it in this month. . . **Lockheed** of Burbank is about to announce a new low-wing monoplane for the rich private owner and the small transport service. . . it has two **Menasco** engines geared to one propeller. . . no, I don't mean the **Alcor** with the two Menascos lying on their sides, each tuurning its own propeller. . . this one is still another plane. . . they say both engines can deliver power to the single prop. . . or either engine can be cut out so that the other alone supplies the push. . . the motors are housed inside the fuselage so a mechanic can make minor repairs.

* * *

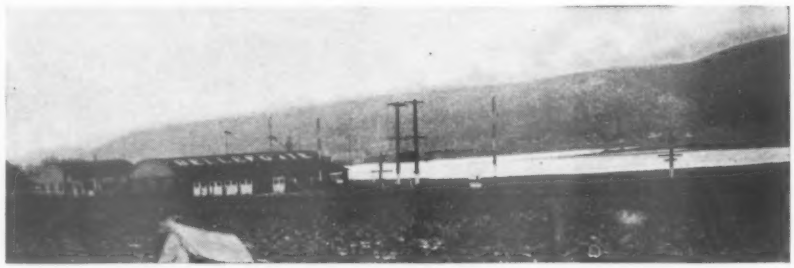
One of the funniest episodes in aeronautical history took place at **Henry Ford's** Greenfield Village at Dearborn, Michigan, last month. . . the occasion was the dedication of the old **Wright Brothers** home and bicycle machine shop where their first plane was engineered and built. . . of course the purpose of the affair was to persuade **Orville Wright** to bring his original ship, now on loan to the South Kensington museum at London, back to the United States. . .

It was a wonderful gathering of aviation pioneers and heroes. . . everyone there knew just why the ceremonies were being held—*but not once was the real purpose of the show mentioned.* . . the **Fords** held their breaths lest **Wright** be asked by some brutal person if he was considering the return to America of his plane. . . their idea is that he should be shown that Greenfield Village is the rightful place. . . then get the idea that he himself first thought it would be appropriate to have the first plane back there. . . the dinner at night was the funniest moment. . . **W. E. Scripps,** publisher of the Detroit *News,* got up and talked all around the matter at issue and generally sounded the one sour note of the day.

Scripps, a great **Early Bird** promoter—he's one himself—wanted the **Early Bird** organization to endorce the **Ford** idea. . . but the **Early Birds** are not so friendly toward the **Wrights**. . . they remember the outrageous demands made by the brothers. . . demands for big percentages of all profits made in demonstration flights of **Wright** planes. . . and also the long court fight with **Glenn Curtiss**. . . they'd just about as soon see **Orville** keep his ship where it is. . . if you don't know it, I recommend you look up the history of the **Wright Brothers**—or **rather Orville Wright's** silly battle with **the Smithsonian Institute.**

(*Concluded on page* 84)

The Phantom Lake—on an Airport!



Above is a view of Bellefonte's airport with the Phantom Lake creeping over its surface. Below: the highway to the airport also is completely cut off by the lake.

THE Bellefonte airport, nestled in the mountains of central Pennsylvania, has been a spot of interest since the early days of the airmail but few persons, except residents of the surrounding counties, know of the strangest phenomenon of Pennsylvania's Hell Stretch — The Phantom Lake.

As spring approaches each year, farmers southeast of the field keep an eye on a sink hole, which two years ago released enough water to cover most of the airport and nearly 150 acres of farming land. Not only was the landing field inundated for more than two months, but the highway leading to the port was rendered completely useless for the same period.

The Phantom Lake has been coming and going as long as the oldest residents can remember. However, the strange part of the story is that its appearance can never be predetermined. Two years ago it established a new record when it covered more area than ever before, and that was its first appearance in eight seasons.

Located in the limestone area, the Bellefonte field is surrounded by a honeycomb formation with under-ground channels and caves. Several miles east of the field are located a number of "sink holes"

(*Concluded on page* 97)

Air Corps School at Denver

THE War Department has issued orders for the immediate opening of the new branch of the Air Corps Technical School at Lowry Field, Denver, Colorado.

Army personnel for staff and faculty to be moved to the new school consists of 10 officers and 93 enlisted men from Chanute Field, Rantoul, Illinois, and 31 enlisted men from Langley Field, Virginia.

The school will commence its operations as soon as the operating personnel and students arrive. Ten officers and 141 enlisted men who have been undergoing instruction at Chanute Field will be transferred at once to the new school where they will continue their instruction as students. So far they have completed about half of their required course which will end early in June. The number of students to be ordered there for the 1939 school year will be considerably larger. The present capacity at Chanute Field will be maintained.

The school will be commanded by Colonel Junius W. Jones, who will be stationed at Lowry Field in the future. The school will operate as a branch of the Chanute Field Technical School,

(*Concluded on page* 91)

Quandary at High Altitude

by BUZZ HERSHFIELD

This is just in case you've never paid attention to the facts concerning flying at high altitudes. This phase of aviation can be considered as important as first learning to fly.

Next time one of you private flyers plan to fly cross-country, check the altitude of your airports.

Landing at a 6,000-ft. airport, for instance, will be entirely different from anything you've ever tried before.

Remember: one mistake is enough.

A FEW weeks ago I was asked, for some reason or other, to say something about flying in New Mexico on a local "airport reporter" radio program. The announcer collared me a few minutes before the broadcast, and asked me to type out a few questions for him to shoot at me. I could make up the answers as I went along.

Quite naturally, I thought a little explanation of high altitude flying would be interesting, as the broadcast took place a mere 350 feet above sea level. But the announcer, feeling that he had aviation's interest at heart, would have none of it.

"We don't want to talk about high altitude flying," he shushed. "Listeners might think that the airlines running out of here have to land at high altitudes."

So I didn't say anything about high altitude flying. But if I had, what of it? The airlines flying into a field just a few miles from my home airport, at Albuquerque, don't seem to have any trouble with altitude. Neither did the students at a school I operated there. They took to flying in that country in the same way that kids in California, or New Jersey take to flying—and with about the same success. If they were good students, they flew well, and vice versa. I can't see that the altitude had much to do with it either way.

I think it is about time that someone exposes the "mysteries" of altitude flying, and shows that they really aren't mysteries at all—just common sense and a little experience in figuring reasons why certain airplanes are good, others bad, in altitudes above 5,000 feet.

Once, in New Mexico, the governor of the state was moved to appoint me a sort of director of aviation. The duties of the job were not mentioned. However, I presumed that I was supposed to try to help the game along, and began by asking every transient pilot I could corner for an opinion on New Mexico flying. I found that many of them were either scared to death of the high-altitude work, or were too smart to profit by the experience of others.

For example: A year ago last spring, a chap stopped in Albuquerque for fuel and refreshments. He was flying an OX Waco which is a quite substantial bit of flying equipment, but not quite the airplane for traversing the continent, fully loaded, via New Mexico. He had stopped for gas at Gallup, and had left there early in the morning, with the air cold and the Oh-by-Five functioning at its best. His take-off was faltering, to say the least, but with the help of rising air currents around Gallup, he attained enough altitude to worm his way across the hills to Albuquerque.

His good luck at Gallup braces his opinion of himself as an altitude pilot. But when he refuels at Albuquerque it is high noon, very hot, with less than ten miles' wind on the ground. The field is better than 5,000 feet above sea level, and he is flying an airplane with three-foot-long intake manifolds. In spite of the fact that this last is rather baffling to cylinders, which require a certain amount of vaporized fuel, he set sail.

The take-off used all the field. After a graveyard turn over town, he started for the Tijeras Pass. Ordinarily, it takes 7,000 feet to clear the lowest places, and our intrepid aeronaut was still some 500 feet shy on his altimeter when he reached them. So what did he do.

He remembered a vivid description of airplane controls in "Modern Flight," I imagine, and pulled the stick back, thereby hauling the nose up in precisely the same manner as in hospitable, sea-level California. Undaunted by the fact that his puzzled altimeter was not performing as the book had said it would, he mushed along at about 50 feet above the trees, astonishing the natives and scaring the goats. This kept on, thanks to the lifting power of the Waco 10, until a rather prominent hilltop nipped at his undercarriage. The result was a rather badly cracked airplane and a somewhat damaged countenance. The trees, plus his slow speed, combined to save him from a rather serious crash.

This pilot patently did not use his head. If he had he would have realized that his take-off at Gallup was possible because of the fact that the air was cool. There was, besides, considerable wind and luck helping him. Had he waited at Albuquerque until later in the day, or until morning, or had he so arranged things that his engine would operate efficiently, he probably could have made it across the hump. He would have looked his ship over pretty carefully, weighed his baggage, and if he found that he was carrying to big a load, he would have shipped a good part of it from there. He would have done his climbing out in the clear, circling until he had gained his altitude, instead of sticking his neck out by flying 50 feet from a very immovable object. Then, if he saw that he still couldn't make it, he should, as a last resort, have flown down the Rio Grande to El Paso and taken a much lower route to the East, thereby saving himself a perfectly good airplane.

While operating a school at Albuquerque, I noticed many pilots coming in much too slowly for landings. The resulting drop, from ten to twenty feet with a resounding *kerplunk*, put quite a strain on the undercarriage. This could have been averted by keeping about 10 or 15 extra miles in the glide to compensate for the rarified atmosphere. Everybody is supposed to know that, but it's surprising how many people forget and come mushing into mile-high fields.

The same thing applies to take-offs, although it is quite impossible to take off slower than the airplane will fly, even though any sap who wants to can slow a flying ship down to where it won't fly. I have found, by experience and by asking others, that it is best to let

(Concluded on page 78)

the NATIONAL AIR BOARD Says...

Dr. Alexander Klemin, Chairman

AT its 24th meeting, the Air Board took up two important topics: The encouragement of private flying and the mandatory licensing of all planes and pilots.

There were a number of distinguished and well informed guests present. Mr. R. R. Loening, president of the Seaplane Flying Association, made a splendid plea for the extension of seaplane flying; Grove Webster (rumor has it that he will be in charge of the new private flying section of the Bureau of Air Commerce) gave us some hopeful news in regard to airports; William M. Wherry, a member of the New York Bar Association's Aviation Committee; and Ralph G. Albrecht, another interested member of the Bar, guided the "legal" aspects of the deliberations.

What Private Flying Really Needs

Captain Richard H. Depew set the ball rolling by giving his opinion on what private flying really needs:

1. Equipment specially designed for the private flyer.

2. A good machine of average performance and one calling for very moderate skill on the part of the novice.

3. Equipment at much lower prices than available at present. Airplane builders are very often blamed for the relatively high price of low or moderate powered airplanes today. But are they really to blame? Out of every dollar, the builder has to spend 40 cents for the engine, instruments and accessories. Such items are largely out of his control and are quite expensive. It is only on the remaining 60 cents that he can reduce costs; and with the limited production of today, it is impossible to do much in this direction. As flying becomes more popular and numbers of aircraft sold increase, so will prices go down.

4. More Places to Land: It was on this requirement that Captain Depew laid the main stress. The private flyer has not enough places to go to or to land in. There are indeed many fine airports. But if a man goes off for his summer vacations, where can he find, either by seashore, by the side of a lake, or in the mountains, even a small field to land in, or a place where he can secure the minimum of aviation service? Certainly nothing would help private flying than more general facilities of this sort.

5. Lower insurance rates are necessary, and here everyone can help by preventing dangerous flying at all times.

6. "Less complicated air regulations are essential." Sympathetic murmurs from the Board greeted this remark.

7. Finally, the speaker stressed the necessity of providing tours and air picnics to enliven flying itself. Flying round in an airdrome soon becomes a very dull affair. If we could devise more aeronautical events (quite distinct from races and competitions) there would be far greater inducement for a man to buy a machine, and to use it constantly after purchase.

A Strong Plea for Seaplane Flying

Mr. Loening took up the cudgels for water flying in convincing fashion. It is perfectly true, Mr. Loening said, that facilities for land flying are still too rare. But did not almost every river, lake or seashore provide a haven for the seaplane or the flying boat? Did the Air Board know that a regular commuter's airline had operated successfully between Oyster Bay and the foot of Wall Street in New York City, bringing sportsmen pilots to their daily work? The number of seaplane commuters has increased very largely in recent years, and their numbers would grow still faster in the future. Of course seaplane bases, easy to construct and easy to maintain should be supplemented by suitable hangars. In New York City there is not a single hangar available in the immediate vicinity of the few seaplane ramps. Mr. Loening advised every member (and every reader of POPULAR AVIATION) to root for water flying; to write to the Mayor of his city for added facilities; to pester his Congressman for the same purpose.

A Hopeful View

Grove Webster gave members some encouraging news. An airport survey of $150,000 to be undertaken by the Bureau of Air Commerce might lead to a Federal Policy of airport construction on a large scale. New bills in Congress provided for encouragement of airport construction by municipalities. Air regulations of the Department of Commerce were being liberalized.

A Legal Battle on Mandatory Licensing

William C. Fleming, a member of the Board and of the New York Bar, well versed in aviation legislation, made a strong appeal for mandatory licensing of all flying with many excellent arguments at his command. Certainly whether flying of any sort, whether inter-state or intra-state, whether for pleasure or for hire or reward, should be licensed in some manner or other. But there are many difficulties to be overcome.

Mr. Wherry and Mr. Albrecht followed Mr. Fleming in the discussion. In fact, the topic of States Rights; of what the Constitution of the United States does and does not permit were broached so profoundly by these eminent counsel, that the chairman was frequently at a loss to grasp the content of their remarks. Therefore instead of reporting individual views, it seems safer for a layman to summarize the views expressed in general terms without imputing responsibility to any one of three legal speakers.

(*Concluded on page* 94)

Listen to the Pilots

THIS is an easy and inexpensive way to get into aviation by employing the wavelengths or kilocycles to land you in the pilot's seat.

Just tune in your radio on the short-wave band (nearly every modern radio has one) and listen to the snappy dialogues between the pilots and the ground stations. The program thus staged is not only interesting but educational.

You will find the following list of frequencies very useful as a guide in tuning into the various airline radio lanes, either on a day or night schedule.

Day	Night	
		American Airlines
5652.5	3232.5	New York—Boston—Montreal
		Cleveland—Boston
5612.5	3232.5	New York—Buffalo—Chicago
5632.5	3257.5	New York—Los Angeles
5602.5	3242.5	Cleveland—Nashville
		Washington—Chicago
		Chicago—Fort Worth
		Boston-Maine Airways
5887.5	2946	Boston—Burlington—Bangor
		Braniff Airways
5042.5	3452.5	Chicago—Brownsville
		Chicago & Southern Air Lines
5682.5	3485	Chicago—New Orleans
		Continental Air Lines
5582.5	3172.5	Denver—El Paso
		Delta Air Lines
5707.5	2854	Charleston—Dallas
		Eastern Air Lines
4122.5	2922	New York—New Orleans
		Chicago—Miami
6590		New York—Miami
		Hanford Airlines
5887.5	2994	Tulsa—Bismarck—Minneapolis
		National Airlines System
5652.5	2946	Miami—Jacksonville
		Northwest Airlines
5377.5	3005	Chicago—Seattle
		Pennsylvania-Central Airlines
5697.5	4335	Milwaukee—Washington
		Trans-Canada Airways
5642.5	3212.5	
	3105.0	
		TWA
4967.5	3088	Pittsburgh—Chicago
		Kansas City
4947.5	3072.5	Kansas City—Los Angeles
		San Francisco
4937.5	3088	New York—Pittsburgh
		United Air Lines
5572.5	3162.5	New York—Chicago
5662.5	3322.5	Chicago—Salt Lake
5122.5	3147.5	Salt Lake—Oakland—Portland
		Vancouver
5592.5	3182.5	San Diego—Oakland
		Western Air Express
5692.5	2906	San Diego—Los Angeles
		Salt Lake—Helena
		Private Flyers
3105	6210	

Flying Insurance: Can You Get It?

by HARRY WHITE

Like everyone else, we can turn to insurance records and figures for facts. Almost every American company today will insure the air traveler.

IT WAS not so many years ago a passenger in an airplane was considered a bad risk by the life insurance companies.

At that time, if one happened to carry a recently issued life insurance policy underwritten by the strongest of companies, there was bound to be a clause in it somewhere declaring that that said policy was "null and void" in the event that the policy holder was injured or killed in flight. Of course, he could risk his own neck if he wanted to, that was his business, but risking the insurance company's money, well, that was something else again.

If one held a life insurance policy in any of the old line companies, which had been issued before flying became a reality, his policy usually contained a clause stating that it was "incontestable for any cause" after a definite period of time, generally one or two years from the date of issuance.

However, that clause was inserted for an entirely different reason than to deter one's flying ambitions. It was designed to protect the company against those who, with suicidal intent, secured a policy with the premeditated intention of "shuffling off" to the chagrin of their acquaintances and for the greater good, financially, of their beneficiaries or estates.

All that is now ancient history. Today we find the greatest tribute to the safety of flying is paid by the life insurance companies themselves. Not in songs of praise nor paid recommendations, but rather by the fact that the company no longer considers flying as a paid passenger an unnecessary risk on the part of the policy holder.

So safe do some of the casualty insurance companies consider flying that they will sell you a $5,000 life insurance policy, good for a two-hour flying trip, for as little as twenty-five cents. This is an over-the-counter transaction without medical examination, similar to the trip insurance policies sold in every railroad station to nervous travelers.

The old line life insurance companies have not, as yet, gone quite that far in their demonstrations of confidence in flying, but their attitude is vastly different than it was when the Biblical minded folk used to say, "If God intended man to fly He would have given him wings."

Insurance firms consider this airliner no more risky than a long-distance train.

Unfortunately, there seems to be no one general insurance rule governing flying which can be applied in blanket form by all companies. Even today, most insurance companies make their own rules and handle each case on its individual merits.

That being the case, it behooves every buyer of life insurance, if at the time of purchase he has the remotest idea of taking an airplane trip, to ask the insurance salesman just what protection his policy contains. Of course, when he does ask such a question he may be asked to fill out an Aviation Questionnaire which will be scrutinized very carefully by the company before the policy applied for is issued.

This questionnaire is harmless in itself as all it does is to give the company a picture of your flying experience and your flying views or intentions for the future. It in no way affects your present policy holdings.

Here is one of the questions you will be asked:

"To what extent have you flown during the present year and past three years? Please designate the number of takeoffs rather than flights.

The last sentence in the above question may confuse you a bit for perhaps to your mind, an airplane trip consists essentially of the distance traveled from the point of departure to the place of destination. For example, when you take a train from Chicago to New York, that, to your mind, constitutes your trip. You would not think that every station stopped at on the way would be counted as a separate trip.

But life insurance companies look at the matter a little differently when it comes to flying, and consider each takeoff as a definite trip. Therefore, if you fly nonstop from Chicago to New York that's one trip, but if your plane comes down at Cleveland, Buffalo and Niagara Falls on your way to New York it consists of three trips as the insurance companies see it. This ruling is based on the fact that many accidents in plane travel, although seldom really serious ones, occur at the takeoff or landing.

You may also be asked as a part of your first question, whether your flying experience was "As a fare paying passenger or other flying."

The second question usually asked is, "Explain other flying?" Did you go up as a student pilot, as a nonpaying passenger in a friend's plane, or in any other way than as a paid passenger in a plane piloted by a licensed pilot and also licensed to carry passengers for pay."

Then comes the question, "Do you expect to fly more extensively in the fu-

(Concluded on page 78)

PRINCIPAL DIMENSIONS OF THE NC BOATS

Span, upper wing	126′-0″
Span, lower wing	94′-0″
Chord of wing	12″-0′
Length overall	68′-3″

SURFACE DATA

Wing section of main wings	RAF-6
Structural weight of wings	1.5 lb. sq. ft.
Area of main planes, incl. ails	2,380 sq. ft.
Area of stabilizers	268 sq. ft.
Area rudders	69 sq. ft.
Area elevators	40 sq. ft.
Area fins	79 sq. ft.

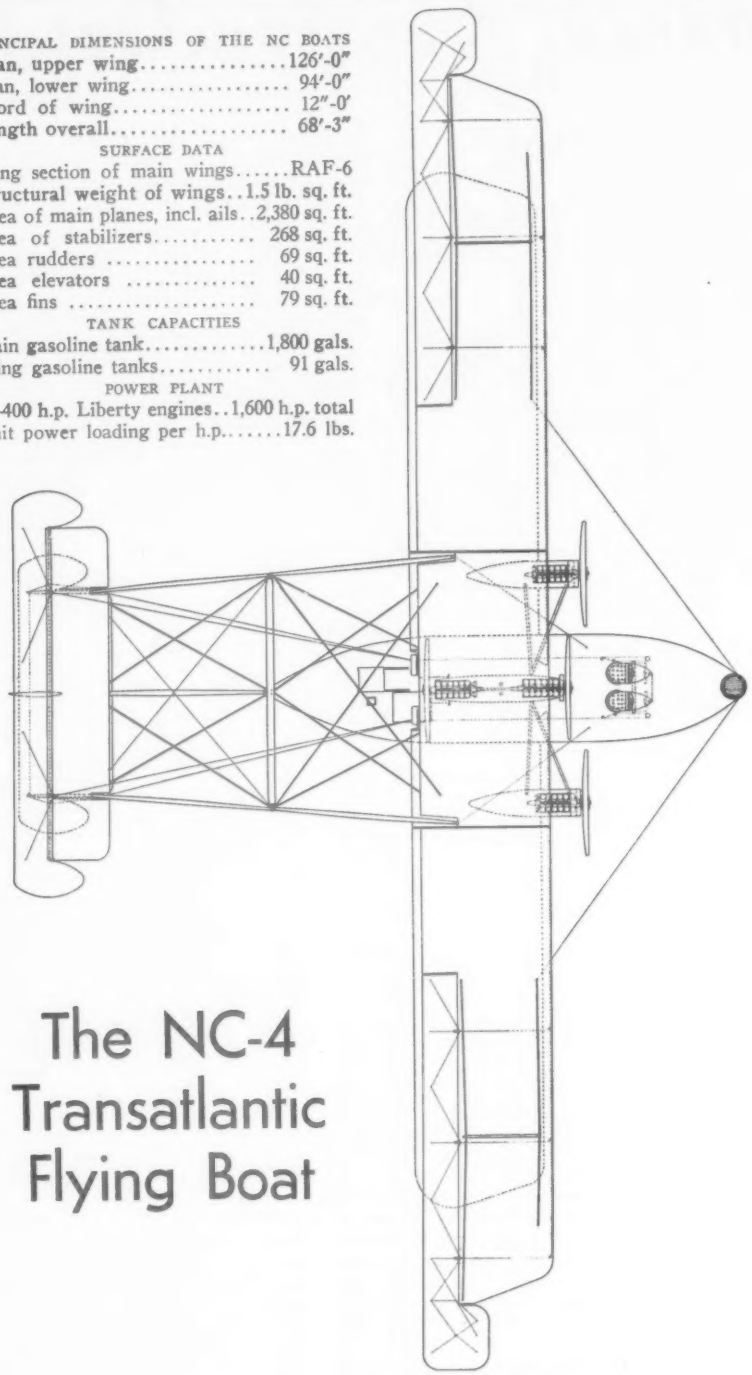
TANK CAPACITIES

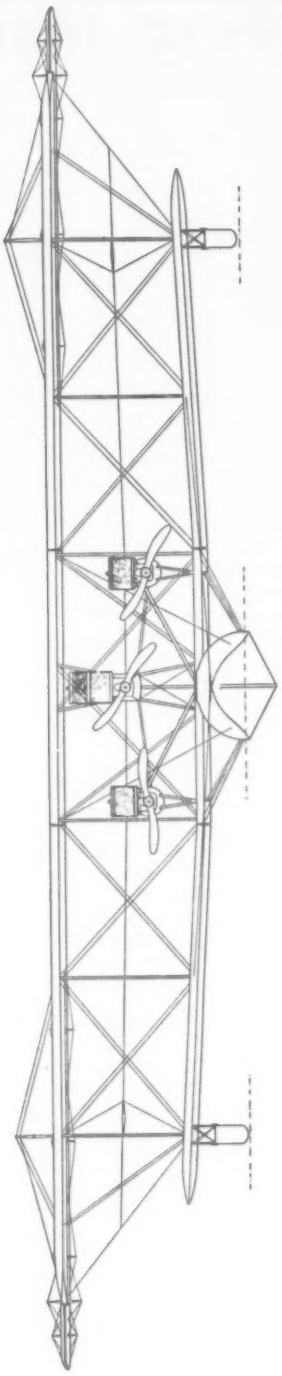
Main gasoline tank	1,800 gals.
Wing gasoline tanks	91 gals.

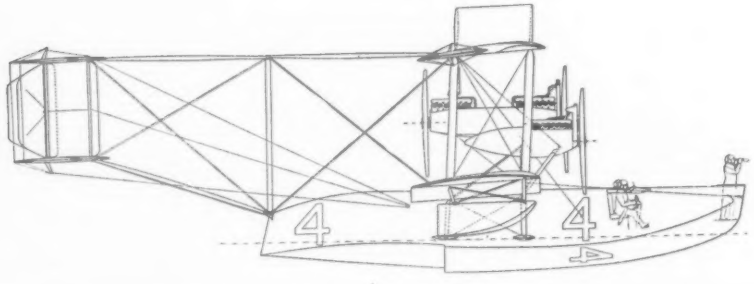
POWER PLANT

4—400 h.p. Liberty engines	1,600 h.p. total
Unit power loading per h.p.	17.6 lbs.

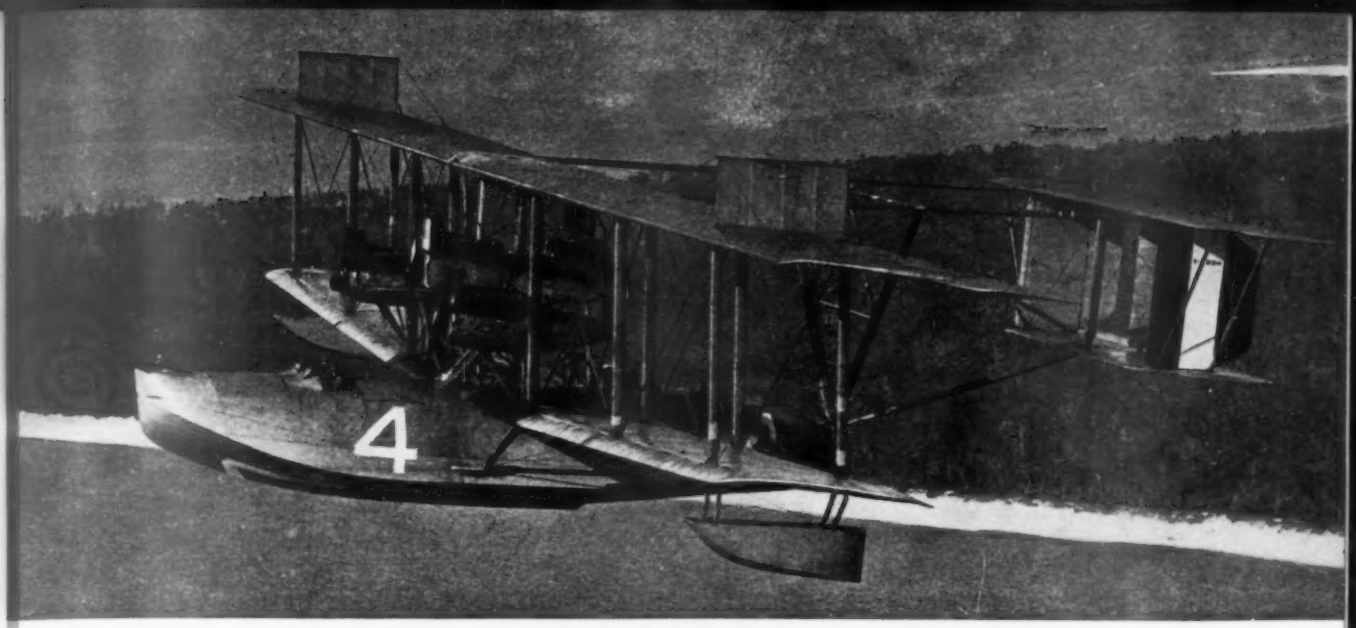
The NC-4 Transatlantic Flying Boat







Scale of feet



Proudly the huge naval boat, the NC-4, started on the first non-stop flight across the North Atlantic—a symbol of the huge transatlantic airliners that were to follow.

The NC's First Atlantic Hop

IN the following article we remind the public of the first transatlantic hop that preceded the Lindbergh flight by a good eight years.

ON May 16, 1919, or almost exactly eight years before the famed Lindbergh transatlantic flight, the U. S. Navy NC-4 flying boat started out on the first Atlantic crossing. But, having no sponsor behind it, the public was only mildly interested in the feat and the flight was soon forgotten.

Even the aviation magazines of that day did not go into hysterics over the NC-4 and its personnel as they did later over the Lindbergh flight and the daily press disposed of the matter with a few columns of dry-as-dust comment. Thus, there are but few men today, even men in aviation, who can recall the meaning of the symbol NC-4.

The NC-4, with its three sister ships the NC-1 and NC-2 and NC-3, were navy flying boats designed for repulsing submarine attacks. Three of the ships crossed the ocean but the NC-4 was the only one of the trio to complete the non-stop flight from Trepassy Bay, Newfoundland, to Plymouth, England, with stops at the Azores, Lisbon, Mondego River and Ferrol.

The total distance of the flight, starting at Trepassy Bay and ending at Lisbon, Portugal, was 4,791 miles. Commander A. C. Read was in charge of the flight and was accompanied by Lt. E. F. Stone, Lt. Walter Hinton, Ensign H. C. Rodd, Lt. J. L. Breeze and Machinist's Mate E. C. Rhodes. The flight continued from May 16 to 31, 1919. The design and construction of the NC ships was supervised by Commander C. G. Westervelt, but the design of this series was actually initiated by Rear Admiral D. W. Taylor, chief constructor of the U. S. Navy.

While the orginal NC-1 was equipped with three tractor Liberty engines, experience suggested the installation of a fourth pusher engine which was then employed in all of the succeeding NC's. The NC-1 was constructed and given her trials in October, 1918, and the sister ships NC-2, NC-3 and NC-4 followed in quick succession.

Fully loaded, the NC-4 weighed 28,000 pounds, the empty weight being 15,874 pounds including radiator water, radio fixed instruments and equipment. The available load for crew, fuel, oil and miscellaneous supplies is therefore 12,126 pounds or over 43 percent of the total weight. The loading per brake horsepower was 17.5 pounds, which was quite low for a plane of this type. The following dimensions will be of interest, showing that the NC ships were comparable to the largest ships of the day in respect to wing dimensions, etc.

The Liberty engines were the high-compression "Navy Liberties" that developed 400 horsepower under normal conditions.

The main gasoline tanks, with a total capacity of 1,800 gallons, consisted of nine 200 gallon tanks or welded aluminum construction. They were the first tanks of this type to be used on large planes and weighed only 0.35 pounds per gallon of contents. The tanks were carried in the fourth compartment in the hull, well to the rear of the personnel.

Great interest attaches to the construction of the mammoth wings which

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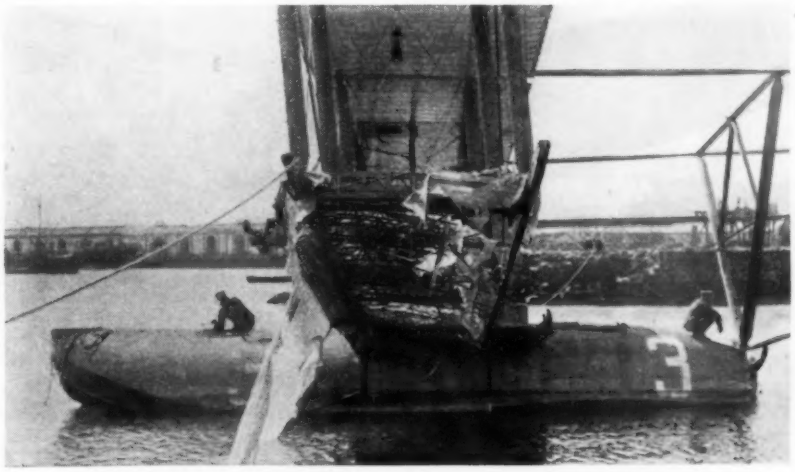


And here we have the NC-3, somewhat messed up after her attempt at the record. Just a little engine trouble in mid-Atlantic.

ADVENTURE in the STRATOSPHERE

by CAPT. ALFRED H. JOHNSON

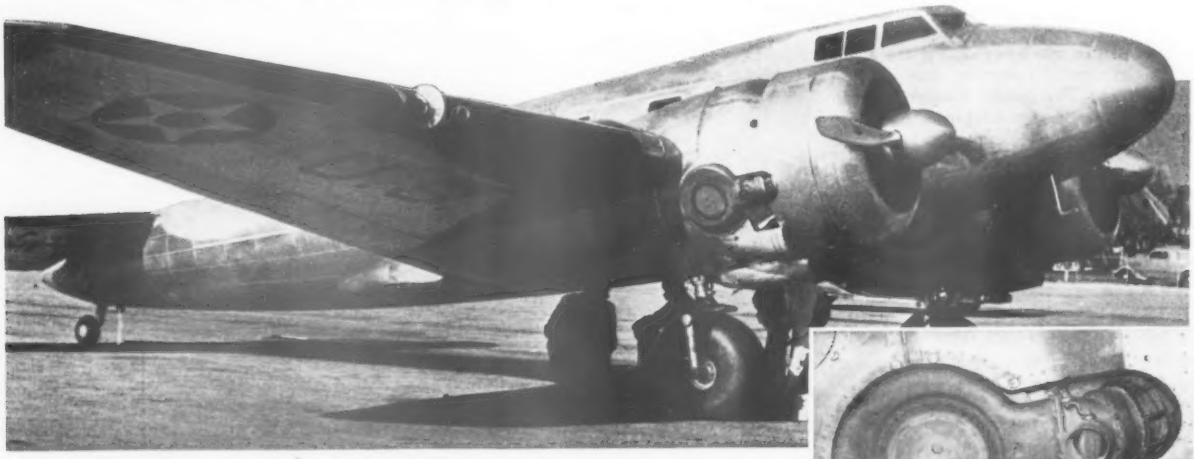
It has been the Army Air Corps' good fortune to own the first successful stratosphere airplane. Captain Johnson was selected as the ship's pilot.

PRESENT commercial transports and military aircraft are capable of operation at altitudes considerably above the present levels permitted by regulations but it is known that long periods of operation even at levels around 12,000 to 14,000 feet have some ill effects on the crew and passengers. Pressure cabin airplanes will therefore be designed to maintain a pressure equivalent to approximately 8,000 feet, and perhaps slightly below. From tests conducted by the Material Division of the Army Air Corps it appears that ten cubic feet of air per minute per passenger is sufficient to keep the air clean and healthful. This amount of air, however, will not be sufficient for circulation purposes and the air in the cabin should be kept moving by some circulation system. It may be that the heating and ventilation system can be combined. The amount of heat obtained by compressing ten cubic feet of air per minute per passenger may reduce the capacity of the heating system required but will not be sufficient to do away with a heating system.

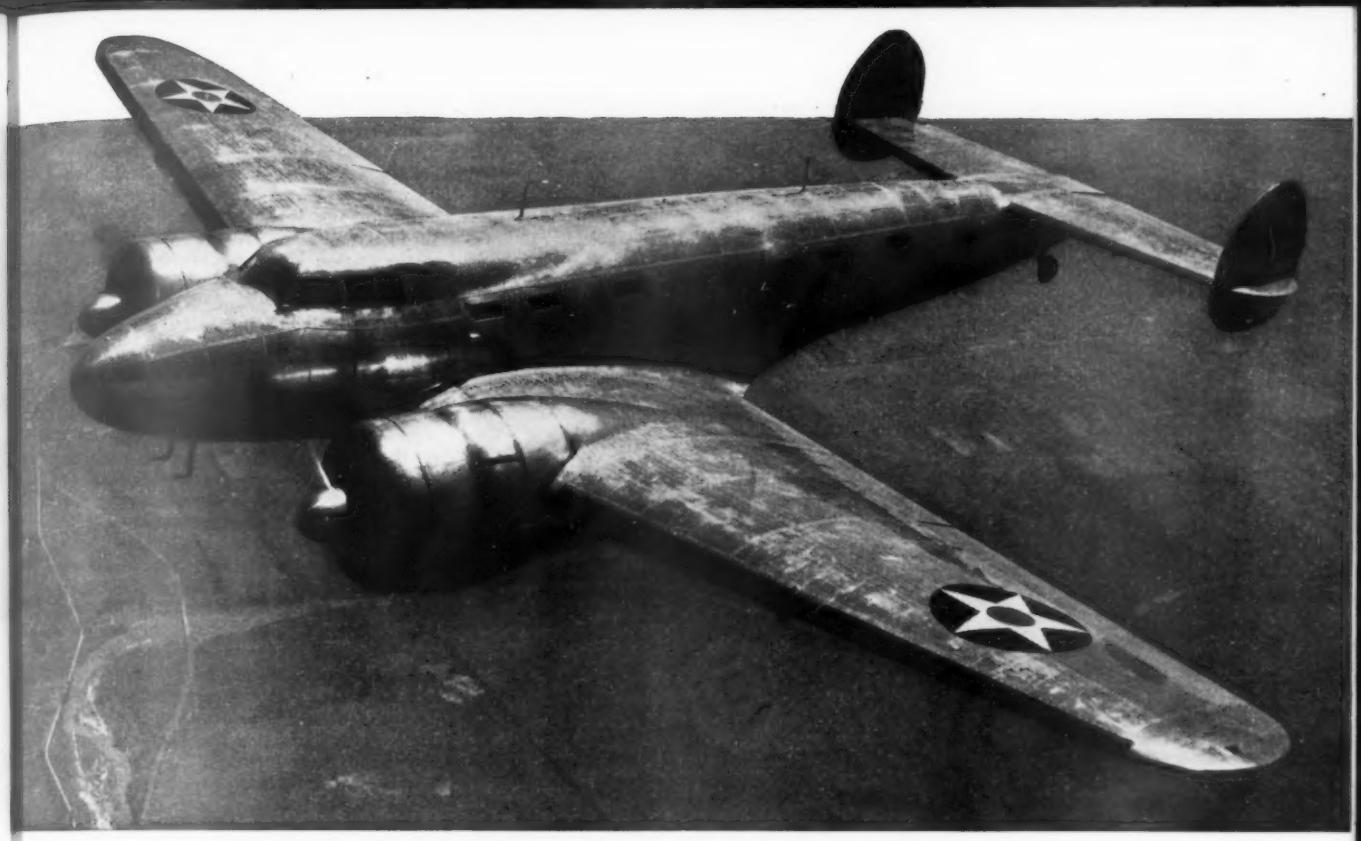
For supplying the necessary air under pressure, two methods have been proposed: One, the use of a centrifugal blower mechanically or turbo driven; and the other, a mechanically driven Roots blower. The exhaust turbo-driven centrifugal blower was used by the Air Corps because it was the most suitable method available at the time and it was readily adaptable to the exhaust driven engine supercharger. This type of installation has one major disadvantage in that the speed of the cabin supercharger varies with the main engine power output. It is therefore necessary to use considerable power when descending from high altitude. Due to the now almost universal use of constant speed propellers, the mechanically driven centrifugal blower or Roots blower may be geared directly to the main engine and a small speed range is assured. A small speed range is important, especially when the centrifugal type is used. At the present time there are no mechanically driven cabin superchargers available and development of the two types should be started immediately. The Air Corps has contacted various interested parties in the industry and hopes to have specifications available shortly. To assure a margin of safety, two cabin superchargers should be used, each capable of meeting the cabin pressure and flow requirements.

The type of pressure control system will vary somewhat with the type of supercharger used but in any case, it should be automatic with provisions for manual control in emergency. Some of the automatic mechanisms which will be needed are: A device for closing all outlet air ducts in case of supercharger failure; an automatic cabin pressure regulating valve; automatic spring loaded valves of large area which will prevent excess pressure in event of failure of control mechanism and automatic means to prevent negative pressure in cabin relative to outside atmospheric pressure.

Cabin pressure tightness in a supercharged cabin airplane is a considerable problem. A general requirement for cabin tightness should be that: in case



With the exception of its cigar-shaped fuselage, the XC-35 closely resembles the standard Lockheed Electra. The ship's two superchargers (right) cost $4,000 each.

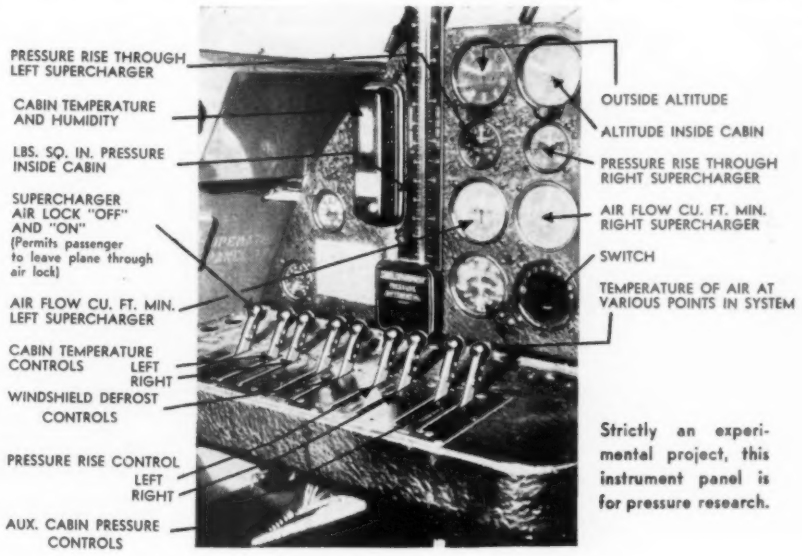


The Air Corps Lockheed XC-35, Army stratosphere experimental ship, is shown here on a recent test flight. Captain Johnson is at the controls. He writes of having climbed the ship to 30,000 feet.

of complete supercharger failure the cabin should be so pressure tight that the airplane may descend from its maximum cruising altitude at 200 to 544 feet per minute to a safe altitude for cruising without pressure, before the cabin pressure goes below a safe minimum. The greatest source of air leaks will be around doors and the air required to run de-icers and flight instruments. Leaks around doors may be eliminated by the use of inward opening doors. This is not a very desirable feature but some means could undoubtedly be developed for sealing them more perfectly or making them outward opening in emergency only. Present day air pumps used to run the flight instruments and de-icers are of the suction type and their capacity and performance fall off rapidly with inlet depression which makes it almost mandatory for the inlet air to to come from the pressure cabin when operating at high altitude. To eliminate the instrument air loss will require the development of pressure type instruments operating with a closed air system.

Another quite serious problem in pressure cabin operation is the development of a means of defrosting and de-icing the pilot's windshield both inside and outside. The thickness of glass required to stand cabin pressure safely prevents the de-icing by application of heat on the inside. A mechanical device or means of supplying heat on the outside of the windshield will be required.

Before going into detail on the operation of the XC-35 airplane, it would probably be interesting to present some of the experiences encountered in the early flying and testing of this airplane. After certain flying by the Lockheed Aircraft Corporation to determine that the airplane flew satisfactorily as a normal airplane without pressure, a crew was sent from Dayton, Ohio, to conduct the official flying acceptance test. We were all quite aware that similar tests conducted in Europe had ended disastrously and therefore planned to proceed rather cautiously. The first flights were to check the general flying qualities and were satisfactory except that the visibility from the pilot's cockpit was none too good. This was due to the fact that the windshields in the pilot's cockpit were of "resinoid" material and not very large and also to the fact that the pilot's canopy was extremely faired into the fuselage in order to save structural weight. The material in the pilot's compartment windshield was changed after the first pressure flight testing, to three-quarter inch laminated plate glass which improved the visibility considerably. After the general flight tests were completed we decided to blow the fuselage up several times on the ground to test cabin tightness and to check the opera-


PRESSURE RISE THROUGH LEFT SUPERCHARGER
CABIN TEMPERATURE AND HUMIDITY
LBS. SQ. IN. PRESSURE INSIDE CABIN
SUPERCHARGER AIR LOCK "OFF" AND "ON" (Permits passenger to leave plane through air lock)
AIR FLOW CU. FT. MIN. LEFT SUPERCHARGER
CABIN TEMPERATURE CONTROLS LEFT RIGHT
WINDSHIELD DEFROST CONTROLS
PRESSURE RISE CONTROL LEFT RIGHT
AUX. CABIN PRESSURE CONTROLS
OUTSIDE ALTITUDE
ALTITUDE INSIDE CABIN
PRESSURE RISE THROUGH RIGHT SUPERCHARGER
AIR FLOW CU. FT. MIN. RIGHT SUPERCHARGER
SWITCH
TEMPERATURE OF AIR AT VARIOUS POINTS IN SYSTEM

Strictly an experimental project, this instrument panel is for pressure research.

Looking toward the cockpit in the Army's stratosphere Lockheed. The valves and tanks (right foreground) contain emergency oxygen. Note pressure instruments (left).

tion of the discharge and emergency valves. The first pressure test on the ground was rather amusing. The airplane was surrounded by a large number of curious observers anxious to see what would happen. The air seals around the doors and windows had not been completely adjusted and when pressure was applied to the cabin the many leaks emitted whistling sounds of varied pitch. The less curious observers started slowly leaving the building. As the pressure was increased each whistle turned to a screech and these observers increased their speed toward all exits. The pressure was increased to 15 pounds per square inch and nothing more happened except that we did notice that the windows were considerably bowed due to the pressure. This was rather disconcerting at first, but after we had adjusted all the leaks and seals and made several trials of pressure at 15 pounds per square inch we were reassured and ready for the fist flight test under pressure on May 25, 1937.

Everyone who had anything to do with the development of the airplane was so confident that the airplane would be satisfactory that they wanted to go along on the first pressure flight test. We had two or three applications for every seat in the plane, but six were all that were necessary to read the one hundred or more instruments with which the cabin was filled, so we took off with that number. Upon reaching 12,000 feet altitude we turned on the cabin supercharger and continued upward. Some moisture started to condense on the windshield and we also noticed that the airspeed shown by the airspeed meter was rapidly decreasing. Evidently, somewhere there was a leak from the cabin into the instrument static pressure line. However, by wiping the windshield quite often we could still see to fly. At 20,000 feet altitude there was a thin layer of clouds. The temperature had fallen until the moisture on the inside of the windshield was freezing, so we had to scrape the ice off in order to see. At this point the airspeed meter showed minus 150 miles per hour and since we could not see to fly in the clouds it was decided to call it a day and come down. At least we had made a partially successful flight under pressure and without the use of oxygen to 20,000 feet.

Several more flights were made adjusting instruments and testing the general operation of the airplane above 20,000 feet. On our highest flight which was to 28,000 feet, we were unable to go higher due to the loss in fuel pressure. Nothing very eventful happened on these flights, however, until one day an enterprising Lockheed engineer decided that Major Greene needed an assistant cabin operator and proceeded to show him and the rest of us how effective the cabin supercharger controls could be. He started operating levers like a switchman in a busy freight yard and we were being taken up and down three and four thousand feet several times a minute. Our heads felt as though they were changing dimensions like the bellows of an old-fashioned blacksmith's blower. It didn't taks us very long to put that engineer in one of the back seats. The next day we didn't fly for our heads felt like the "morning after".

After the few minor changes in equipment and controls, the acceptance tests were completed and we started back to Dayton at an altitude of 25,000 feet. At this altitude the plane cruised along fine at 210 m.p.h. and it certainly was a pleasure to be up there in comfort instead of being cold and sucking on an oxygen tube. The trip back was uneventful but we did notice that having the cabin supercharger driven by the exhaust gas was objectionable due to the fact that all variations in engine power had an effect on the cabin's supercharger and made it necessary to manually correct the position of the cabin supercharger controls each time an adjustment was made in any of the engine controls.

The XC-35 airplane is believed to be the first successful supercharged cabin airplane. The airplane resembles the Lockheed *Electra* very closely except for the fuselage which is circular in cross section. The pressure cabin is divided into two compartments; either one or both may be supercharged. The pressure compartment extends from the nose to the station just forward of where the tail surfaces are attached. The airplane is of conventional all-metal construction except that special attention has been paid to sealing all openings and riveted joints. It is powered with two 550 h.p. *Wasp* engines equipped with turbo-superchargers. Each exhaust turbine wheel drives two centrifugal impellers on the same shaft, one impeller supplies the engine requirements and the other supplies cabin air. As originally designed, either supercharger was capable of supplying 150 to 250 cubic feet of air per minute under pressure so in case of failure of either supercharger, the other was able to more than meet air flow requirements for a crew of six or more. In the original design, the cabin superchargers were designed to hold the cabin at 12,000 feet with the airplane at 25,000 feet, but after the first series of tests it was decided to alter the supercharging system so that it would be possible to operate up to at least 30,000 feet with a cabin pressure equivalent to 10,000 feet or less. The system was therefore changed so that it was possible to connect the two superchargers either in series or parallel. With the superchargers in series it is now possible to control the cabin pressure over a much wider range and at higher altitude. Although the air flow was approximately halved it was still well in excess of minimum requirements and in case of failure of one supercharger or engine it is possible to change the system to parallel operation and obtain sufficient pressure for safe descent. Pressure and air flow control was obtained by throttling the supercharger intake and varying the size of the cabin discharge opening. Automatic controls have been tried but have not been made to function properly as yet. The maximum airplane altitude on one flight was slightly above 30,000 feet while the cabin pressure was about 11,000 feet. Numerous similar flights have been made with the cabin pressure held at 7,000 to 10,000 feet.

Due to the fact that the cabin superchargers are exhaust turbo-driven it was necessary to descend using 50 to 60 per cent power in order to keep up air circulation. This is undesirable and would not be the case if the superchargers were geared directly to the engines which are equipped with constant speed propellers.

On every flight it has been noted that the relative humidity in the cabin was very low, seldom being above 15 per cent and more often below 10 per cent at altitudes of 20,000 feet and above. This condition although not harmful might not be comfortable on flights of several hours' duration. It may be found desirable to humidify the air after compression.

(*Continued on page* 91)

Oregon's Lightplane Patriot

by LESLIE LONG

It didn't take an "official government stamp" to make George Yates' planes airworthy. His story is inspiring.

Two of Yates' outstanding "home-built" ships are shown on this page. The mid-wing monoplane above bears the famed PFA insignia. That's Yates himself in the above inset.

SORRY, boys, this story is not going to be about another of the more or less well-known Longsters. It is going to be about a fellow named George Yates, who lives out here in Oregon and about whom you should know a lot more than you do. George is a real light-plane fan, a build-them-at-home enthusiast and a persistent fighter of vicious aviation laws. For 15 years he has centered his existence around the building and flying of home-made airplanes. He works, eats and sleeps with them. It is true that he has taken enough time out to acquire a wife and family, but seems only dimly conscious of the fact.

Like many another notable, George got his first urge to fly and his first training by hanging around the old Jenny ships. There has long been a saying that all good pilots got their training in a Jenny, and perhaps it is largely true. Anyway, as an ambitious young sprout he learned to wallop an OX-5 across the tail and make it go places. It was a lot of fun, of course, but there were some serious problems involved, not the least of which was the fact that there were no concealed meal tickets to be found on a Jenny. Even a starry-eyed young pilot has to eat, so our George decided he would have to go work. Being used to noise and sparkplugs and grease, it was only natural that he should become an automobile mechanic and—in passing—a good one. Incidentally, it was at about this time that he began to acquire the above-mentioned family, one or so at a time. To an onlooker it would have seemed as though his flying days were just about over, and that aviation was to lose a genius.

But George had no such weak misgivings. When work was slack and the evenings long he began to work out the ideal ship. It had to be good and it had to be simple and it had to be inexpensive. As the idea took shape he began making small models of his brain child, most of them brazed up out of welding rod, a rather unusual model material to say the least. One fine day he concluded he had what he wanted and was ready for fate to bang on the door. It did.

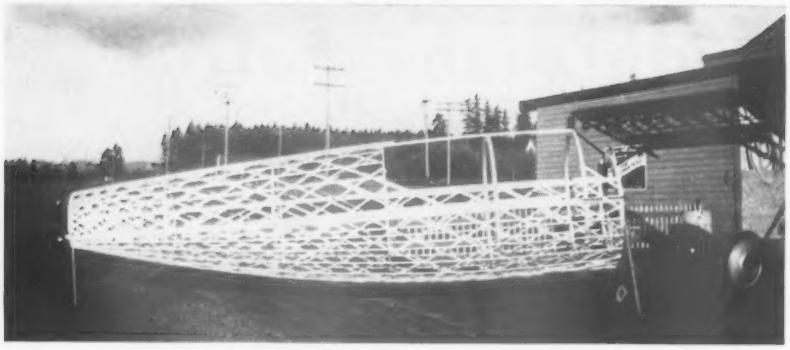
In 1929 he was in the employ of a gentleman named Elmer Stipe. This man had vision and he sensed the value of George's inventive ability. After looking over the models he proceeded to finance the first of the series of Yates ships. This job was designed and built for a 90 h.p. Cirrus engine. From the day in 1930 when it was test-hopped to this day it has been an outstanding success. Wanting more speed, Mr. Stipe had the Cirrus replaced by a 100 h.p. Menasco, which was in turn replaced by a 125 h.p. Martin. In all these years not one single failure has occurred, not a joint loosened. Known all over the Northwest as the "Stiper" it has had a vast number of hours and has been a source of great pleasure to its owner.

Following the Stiper came a ship in the lighter class. It was a single-place job and powered with a nine-cylinder, 45 h.p. Salmson engine. The entire design was unique. Except for fittings, motor mount and landing gear the entire ship was of wood. There were no longerons and no wing beams, and it flew like a scorched hornet. Built for and still owned by Robert Fulton, it was placed on exhibition in a Portland show room and practically stopped a meeting of Northwest air executives. Blasé big shots looked it over with frank astonishment. Here was something new that hadn't come out of a mahogany-lined drafting room.

Shortly after completing the Fulton ship, George met up with a personage who very nearly took him to the cleaners—Old Man Pneumonia. Unscathed through years of flying and test-hopping every sort of good and bad airplane, he had to put up the fight of his life to win out. But he did it, and it was while putting in the long hours of hospital convalescence that he decided the dreary days of balky batteries and cold repair shops were over. From thence onward it was to be all airplanes, or it could be anything it wanted to—including the poorhouse.

So he hied himself to the American Mecca for sport plane builders: the little city of Beaverton, Oregon. Bernard airport is unique in American aviation. Try to picture a well-kept airport, bordered along one whole side by a row of 20 hangars, each housing one or more trim ships. And gentlemen, *practically all these ships are home-made.* This place is a living example of what young America can do if given a chance. Anyway, it was the place for George and he

One of George Yates' most popular and successful ships is the high-wing parasol monoplane above. Drastic government regulation has outlawed aircraft like this.



Above: the fuselage of a typical ship designed and built by George Yates shows the ingenious method of construction. It is somewhat like Britain's geodetic system.

knew it. Starting from scratch it was practically no time until he had a shop and some tools and had gone to work. The venture was a success from the start.

And now we come to the oyster in the stew, as it were. The Yates System is based on a structural method that is not new in engineering but one that is, or at least was, new in aircraft building. It is the diamond mesh, or lattice type of construction, well known to engineers for many years. Perhaps the best example today is the lattice masts used on American battleships. Basically the Yates construction is the skin-stressed, monocoque type. A little study of the accompanying photographs will show its beautiful simplicity. It is inherently braced against loads from every angle. While exceedingly strong it is not entirely rigid and is able to absorb shocks that would wreck any other type of structure. Weight for weight it is beyond doubt the lightest design ever developed. As an instance of this, the entire fuselage structure of an average lightplane will weigh less than 30 pounds.

The Stiper was built of steel, the material being the familiar quarter-inch tubing of .028 gauge. The average length of the mesh was (and still is) about five inches. Where the tubings cross it was simply brazed together, a very simple job. Notwithstanding the eight years of rough and ready flying, not a single one of these joints has let go. Every one who has flown the ship has remarked on the freedom from motor vibration, the elastic structure absorbing all shocks from the engine. Heavy landing shocks are also effectively taken care of.

After completing the Stiper, Yates became a convert to wood construction and every ship since built has been made of that material, excepting, of course, motor mount and landing gear members. This method of building is undoubtedly the lightest, strongest and cheapest that has been devised to date. For the average single place lightplane the spruce strips are but ¾ inch wide by ⅛ inch thick. The bulkheads are simple plywood oval rings, cut from stock ranging from one-quarter to three-quarter inches thick. Material for the entire fuselage structure may be had for less than $10, and if that shouldn't interest the amateurs it would be hard to say what could. Assembly is not difficult. After the size and shape of the bulkhead rings have been decided on from preliminary drawings they are cut out and then placed in position on a framework made of scrap lumber. The strips are then simply laid on in an easy spiral, usually making from two to three turns in the length of the fuselage. Where they cross the bulkheads they are nailed and glued. Another set is then placed over the first, wound in the opposite direction and these are also nailed and glued to the bulkheads, as well as to the other strips where they cross. Toward the rear end, where the structure gets quite small, some of the strips are cut off to prevent crowding.

(*Concluded on page 76*)

A Yates fuselage like that at the top of the page is shown here with part of its covering. Note simplicity with which two open cockpits can be cut in the same design.

Air-Minded Purdue

DELIVERY of a new *Cub* airplane to the Purdue University airport was occasion for the announcement of a cooperative flight test program in which members of the aeronautics staff of Purdue University plan to work with engineers of the Piper Aircraft Corporation in the development of new flight test technique which it is hoped will incidentally yield data leading to improvements in the airplane.

The plane was flown from the factory to the Purdue airport in West Lafayette, Indiana, by Captain L. I. Aretz, lessee of the airport, who will also serve as test pilot for the experimental work. Legal ownership of the plane is the personal responsibility of Prof. K. D. Wood, head of the Department of Aeronautical Engineering, who has outlined and will develop the test program. Results of test work are available for undergraduate instruction; graduate students, including Paul C. Emmons, formerly of Waterman Aircraft Corporation, and W. L. Hull, formerly with the Chrysler engineering laboratories, have been working on the design of instruments and apparatus for the test work with promising results. Professor Wood is assisted by Prof. Joseph Liston, of the Purdue staff, who is especially qualified in engine and dynamometer work.

One of the immediate objects of the test program is the determination of propeller characteristics from power measurements in flight and towing tests behind a larger airplane. . Data are recorded photographically and moving pictures of gliding flight path through a screen grid have been found to permit a satisfactory check on the towing tests. No data of this sort are at present available; propeller design data based on wind tunnel tests alone has been found to be subject to large and uncertain corrections, particularly for small wooden propellers such as are used on most of the small airplanes of today. When the propeller and engine characteristics are accurately known, the effect of small improvement in design can be quickly and accurately determined by additional flight tests.

It is also proposed to use the airplane to determine the relationship between wind tunnel tests and flights, not only for performance but also for stability and control; a small wind tunnel is available at Purdue and access to larger wind tunnels at the University of Michigan and at the California Institute of Technology has been assured. Publishable data on the correlation between wind tunnel and flight tests are strangely very scarce, and one of the major objectives of the Purdue flight test program is to extend this field of knowledge.

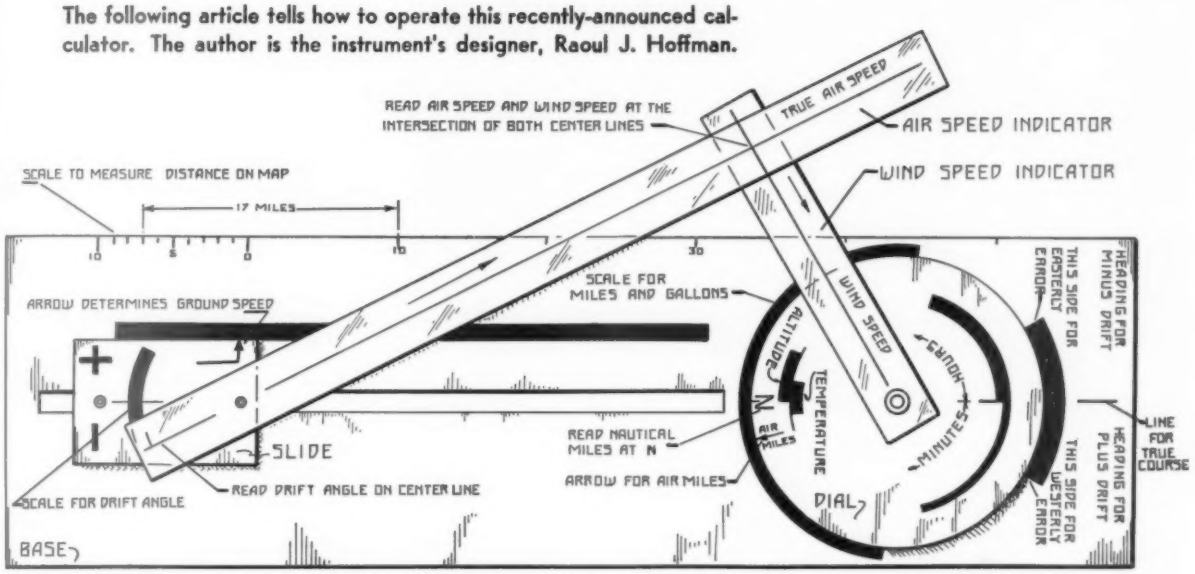
Construction of an additional airplane designed primarily for flight test work is planned as an additional project for graduate aeronautical work at Purdue.

END

Popular Aviation's

FLIGHT CALCULATOR

The following article tells how to operate this recently-announced calculator. The author is the instrument's designer, Raoul J. Hoffman.



POPULAR AVIATION'S flight calculator is an instrument that will help to solve most of your dead reckoning problems with a minimum of manual operations. It calculates drift angle, course, heading, magnetic or compass reading, wind speed and direction, duration, air speed correction for altitude and temperature and corrections for variation and deviation.

Check your instrument carefully with accompanying sketches and you will know what each scale is meant for. The instrument, made of celluloid, has only a few parts. It consists of a base on which is mounted a dial with a speed indicator, and a slide with an air speed indicator. The base has a 60-degree section for drift and compass error readings, a MILES-GALLONS scale, a scale for GROUND SPEED and a scale to plot your COURSE or to measure distances on standard air maps. The dial carries 360 degree markings and standard compass points; it has a TIME scale and a TEMPERATURE-ALTITUDE scale for air speed corrections.

On the reverse side of the calculator a flight log may be kept with pencil notations that can be washed off easily.

Dead reckoning is a method of calculating a new position by estimating the course and distance from a point of departure. Following are a few terms used in dead reckoning notations:

COURSE is the direction one intends to fly.

The TRACK is the actual path flown over the earth's surface.

The HEADING is the direction in which the plane is pointed or steered, parallel to the fore-and-aft axis of the plane.

The TRUE AIR SPEED is the speed of the airplane relative to the surrounding air.

The WIND is given in the direction from which it blows.

The DRIFT ANGLE is the angular difference between the HEADING and the TRACK.

The air speed given by a standard air speed meter must be corrected for altitude and temperature.

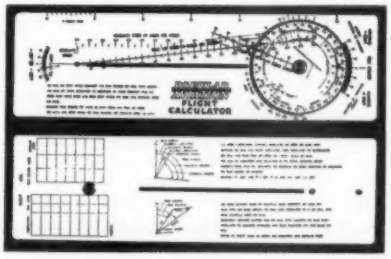
Directions are given from geographic (true) north. For orientation, however, magnetic compasses are used which do not indicate true north. This difference, called VARIATION, is given on all air maps. Compass needles, meanwhile, are influenced by nearby steel and iron parts and will not point to the magnetic north. This difference, called DEVIATION, should be noted on all compasses.

The use of the magnetic compass necessitates conversion of true readings to compass readings, usually the magnetic readings are needed.

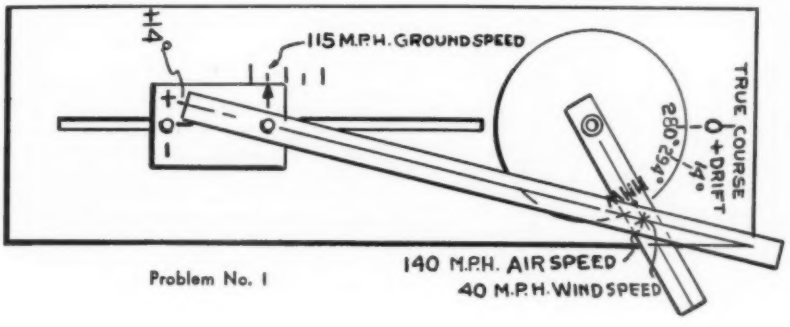
To understand the operation of the POPULAR AVIATION flight calculator, then, the following concrete problems are offered:

Problem No. 1. Find the HEADING when the TRUE COURSE is 280°, the TRUE AIR SPEED 140 m.p.h., the WIND SPEED 40 m.p.h., from NNW (337°).

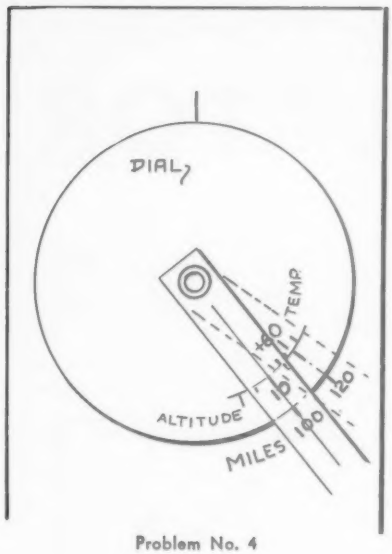
The above sketch shows the calculator's basic parts. Figures are purposely omitted. Below is a photograph (one-fourth actual size) of the calculator, front and back.



Connect 280° on dial with 0° on base, marked TRUE COURSE. Turn center line on wind indicator to NNW. Connect 140 on AIR SPEED indicator with 40 on WIND SPEED indicator. You will now find the DRIFT ANGLE on the slide to be *plus* 14°. The + 14 drift on the top scale is



Problem No. 1



Problem No. 4

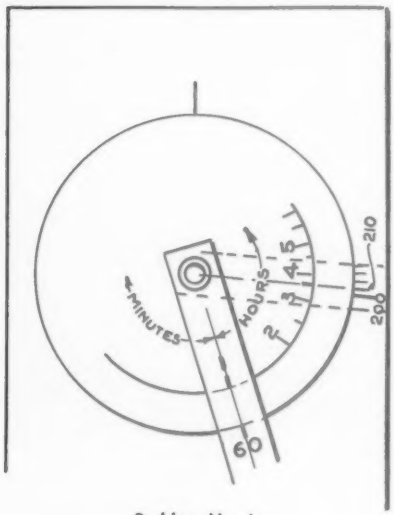
connected with 294° on dial, which is the HEADING. Looking at the GROUND SPEED scale, you will find the arrow pointing to 115 m.p.h. (See Figure 1.)

Problem No. 2. Find the WIND DIRECTION and WIND SPEED when the TRUE COURSE is 280°, the TRUE HEADING 263°, the TRUE AIR SPEED 115 m.p.h., and the GROUND SPEED 130 m.p.h.

Connect 280° with TRUE COURSE and read at 263° a *minus* 17° DRIFT ANGLE. Set arrow on slide at 130 on GROUND SPEED scale, turn AIR SPEED indicator to *minus* 17, rotate wind indicator until its center line passes through 115 on air indicator. You will find the WIND SPEED to be 40 m.p.h., and the center line passing through 157° dial. Therefore, the wind is blowing from 157° or from SSE.

Problem No. 3. Find the TRUE COURSE and the GROUND SPEED when the TRUE HEADING is 105°, the AIR SPEED 80 m.p.h., and a 30 m.p.h. wind blowing from NE (45°).

This problem must be followed carefully, for in its first setting the scales used are not marked with the given denominations.



Problem No. 6

Connect 105° with TRUE COURSE, add 180° to the wind direction, or 45 plus 180 equal 225. Set wind indicator to 225°, set slide to 80 on GROUND SPEED scale, turn air speed indicator until its center line passes through 30 on wind indicator and you will find the drift angle to be *plus* 22°; 105 and 22 equal 127° TRUE COURSE. The whole sequence of operations was reversed and for correct denominations make a second setting. Connect 127° with TRUE COURSE. Turn wind indicator to 45 on dial. Connect 80 on air speed indicator with 30 on wind indicator. You will find the GROUND SPEED to be 70 m.p.h. and the DRIFT ANGLE *minus* 22°.

Problem No. 4. Find the TRUE AIR SPEED when the altitude is 10,000 ft. and the temperature 60° Fahrenheit, and the air speed meter indicates 100 m.p.h.

Connect 100 on scale marked MILES with 10 on altitude scale on dial (use center line of wind indicator). Turn wind indicator to 60° on temperature scale and read the TRUE AIR SPEED of 120 m.p.h. on the MILES scale.

Problem No. 5. Find the duration of flight when the available fuel capacity is 14 gals. and the rate of fuel consumption is four gals. per hour.

Place center line of wind indicator to 4 on MILES scale, turn dial until 1 hour on time scale is on center line. Then turn wind indicator to 14 on GALLONS scale and you will find the center line passing through 3½ hours on time-scale. The duration of the flight is 3½ hours.

Problem No. 6. Find the range of flight when the GROUND SPEED is 60 m.p.h. and the duration 3½ hours.

Connect 60 on MILES scale with 1 hour on time scale. Turn indicator to 3½ on time scale and read the distance of 210 miles on MILES scale (See Figure 2).

Problem No. 7. Find how many nautical miles there are in 310 air (statute) miles.

Connect center line of wind indicator with 310 on MILES scale, rotate dial until arrow marked AIR MILES is on center line, then turn indicator to "N" on dial and read 270 nautical miles on MILES scale.

To make conversions from true to magnetic or to compass readings, add the number of degrees of VARIATION and DEVIATION if they are of the same kind, and subtract them if they are of different kind.

For example, if the VARIATION is 8° W and the DEVIATION is 5° W, the total error will be 13° W. But if the VARIATION is 8° E and the DEVIATION is 5° W, the total error will be 3° E. Always subtract from the greater value.

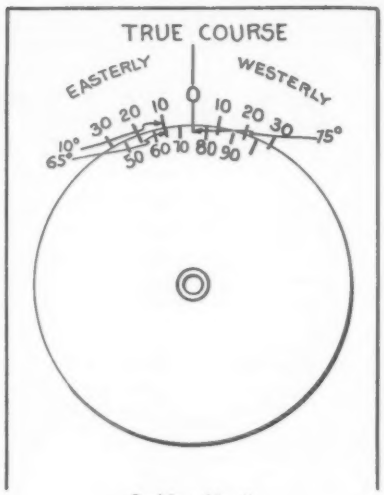
Problem No. 8. Find the COMPASS course when the true course is 250°, and the total error is 13° W.

Connect 250° with TRUE COURSE and read at 13° westerly error, 263° compass course.

Problem No. 9. Find the TRUE COURSE when the compass course is 65° and the total error 10° E.

Connect 65° on dial with 10° in section marked EASTERLY. You will find the true course of 75° at the zero line. (See Figure 3.)

The flight calculator can be used for speeds *beyond the speeds indicated on the scales*. In case the speeds are greater or smaller than the one indicated, the given speeds are reduced or increased by a number, and the resulting speed found on the instrument is multiplied or divided by the same number.



Problem No. 9

Problem No. 10. If the true air speed is 300 m.p.h. and the wind speed 50 m.p.h., divide the speeds by 2. This will give you speeds of 150 and 25 m.p.h., which can be applied on the instrument. If the resulting ground speed is 140 m.p.h., the actual ground speed will be 2 times 140 or 280 m.p.h.

Problem No. 11. The true air speed of a glider is 40 m.p.h. and the wind speed 10 m.p.h. Multiplying both speeds by 3 will give you speeds of 120 and 30 m.p.h. If the resulting ground speed found on the calculator were 105 m.p.h. the actual ground speed of the glider will be 105 divided by 3 or 35 m.p.h.

This same method of conversion may be applied to the time scale, to the MILES-GALLONS scale and to the map scale.

It should be mentioned again that *by following carefully all problems* and by altering the given numerical values, or by reversing the sequence of operations, a skill will be acquired in handling the calculator that will enable the owner to solve intricate dead reckoning problems within a few seconds.

It is hoped that POPULAR AVIATION readers and others who will use one of these calculators will find them the benefit we intended them to be. It is because of the difficulty and expense to which the private flyer has been put to in the past, that we conceived and produced this calculator. Until this calculator had been completed, the private flyer could not obtain a calculator anywhere near reliable for less than $7.00. Even the more expensive devices available to the private pilot did not incorporate the features many pilots have wanted.

Here, then, we have an accurate flight calculator that can be used in aircraft ranging from the *Cub* and Taylorcraft class up to the Stinson, Waco and Beechcraft category. This flexibility, we believe, will prove invaluable to you.

by SELBY CALKINS

It's not often you get to read the yarn behind a pilot's forced landing. These incidents are well worth a few of your crowded moments. Besides, if you fly, profit by these mistakes.

Even famed Frank Clarke, Hollywood stunt flyer (right), has had an uncharted adventure in a forced landing. That finger belongs to Bill Wellman (also see page 10).

FORCED LANDINGS CAN BE FUNNY

FIGHTING a steadily lowering overcast wasn't enough grief for Dudley Steele as he drove across the grey Kansas sky—his motor had to begin dropping revs at an alarming rate!

There wasn't any choice but to sit down. Dud had only a thousand feet to play with and mentally gave thanks for the level farm fields below him as he glanced around for a convenient landing place. Off to the south a bit was a perfect spot. A flapping wash on the clothsline gave him the wind direction, a long level pasture stretched invitingly and a telephone line ran to the farm house.

Far less of a veteran airman than Dudley Steele could have done it—he swung into the wind, cut the throttle, made a smooth landing and rolled to within a few feet of the barn.

You've heard the countless stories about the pilot, the forced landing and the farmer's daughter? So had Steele. He couldn't be blamed then, for a broad grin when the farmer, his wife and a really beautiful young daughter came out of the house and over to the plane.

"Well, son, you haven't lost your sense of humor," commented the farmer by way of a greeting.

"No, I guess not," answered Steele. His eyes strayed again to the farmer's daughter. "Nice place you've got here," he said.

Airman Dudley Steele (left) is shown with another pilot who's also pretty capable.

"Yeah, son, but I'm driving *you* to town," the farmer replied.

* * *

Army Air Corps colonels don't like their names used when their dignity has been ruffled. This one is a Corps veteran who had done everything—up to this certain day—except make an enforced parachute jump.

"The Colonel really rated as a competent pilot," said the young Lieutenant whose job it was to accompany His Nibs hither and yon, "but he always complained that he still must look forward to hitting the silk.

"Not just to jump, you understand, but to jump because there was no other choice. He'd done everything but that.

"We were heading west from Barksdale and had about 12,000 feet over Arizona when it happened," the Lieutenant carries on with the story. "The motor blew for keeps."

Below was the damndest badland you ever saw—no chance for a landing right there so I gave the Colonel the high sign and over he went.

He landed—well, adequately. He sprained an ankle, tore his flying suit, ripped his uniform and skinned his face in a patch of greasewood but otherwise felt much elated.

His cup was full, so to speak—his experience was complete!

The Colonel, on the way down, had seen that there wasn't a human habitation for miles. He bundled up his flying suit and 'chute and started hiking. No destination really, just hiking.

Pretty soon he topped a rise and spotted a sheepherder's camp. He almost ran the mile or so intervening, finally puffing to a halt before the lonely old gent in charge.

"Hullo there," says the Colonel, beaming expectantly.

After all, he had literally "dropped in" out of a clear sky on the old gent and was aching to amaze the desert denizen with the thrilling story.

"Howdy, stranger," says the sheepherder. That was all.

"E-r-r—all alone?" the Colonel gave him another opening.

"Yep."

"How far to town, or a highway or something?"

"'Bout ten mile."

A fine way to treat a Colonel, no less, who had just jumped out of an airplane for the first time in a long and honorable career! No questions, no curiosity, no amazement?

The Colonel restrained his loquacity with difficulty; the sheepherder had no difficulty at all. He finally consented to leave his sheep in a nearby corral and take the Colonel to town on a flea-bitten cayuse.

"So help me," wailed the Colonel when he told me of that long ride to town, "that desert violet never once expressed the slightest curiosity about where I came

(Concluded on page 97)

Build Your Own Bubble Sextant

by EDGAR LESHER

A simple non-technical description of a bubble sextant, easily constructed at home, which is sufficiently accurate and precise for the needs of the private flyer.

THE bubble sextant is the chief observation instrument used in celestial aerial navigation. Its counterpart equivalent used on the sea is the marine sextant which makes use of the natural sea horizon as the datum in measuring the angle of elevation of a celestial body.

There are several reasons why the marine sextant is impracticable in the air. Firstly, the bubble sextant is provided with a spirit level to determine the direction of the center of the earth.

Because a stock bubble sextant costs several hundred dollars it is not available for the average flyer or amateur. But this high cost need no longer stand in the way.

Here is a bubble sextant which can be constructed at a cost of a dollar or two and which will give results comparable with the best of the "store instruments." With it, one can determine his position within ten or fifteen miles, close enough for aerial navigation.

Fig. 2 shows the completely assembled instrument, while Fig. 1 displays the interior with the left side removed. Fig. 4 gives the complete layout data with all necessary dimensions.

The workings of the sextant can, however, best be understood from Fig. 1. The observer looks through the index glass (which is merely a piece of plate glass pivoted at one end) at the celestial object, the angle of elevation of which is to be measured.

If the index glass is in the proper position, the observer can then see the spirit level through the lens by double reflection. That is, he sees the object directly and also through the spirit level by reflection. The two images seem to be superimposed.

The observer then adjusts the index glass by means of the index arm until the bubble of the spirit-level appears to coincide with the celestial body. The angle of elevation is then indicated on the scale.

The rays are traced for a 45 degree angle of elevation in Fig. 1. For this position of the object glass it is seen in Fig. 2 that the scale reads 45 degrees.

Of course, when the sextant is rocked back and forth, the bubble moves in its tube. However, the arrangement is such that the object and the bubble, when once made to appear to coincide, will still coincide when the instrument is rocked. This makes it possible to use the sextant on an unsteady support, such as an airplane.

The conditions that govern this result are that the focal length of the lens, the radius curvature of the spirit level and the optical distance between the lens and bubble must all be equal. In this instrument the distance is 5⅞ inches. This is the distance (A) plus the distance (B) in Fig. 4.

"Shooting the sun" with the home-built bubble sextant described in these pages.

A straight glass tube was bent to this radius in making the spirit-level, and this is also the focal length of the lens. Hence, in order to use this design it is necessary to secure a spirit level and a lens having these properties. Such a lens can usually be found in a cheap telescope.

The lens shown is part of such a telescope and is mounted in the $\frac{1}{8}$" brass tube taken from the same telescope. The focal length of a lens can easily be measured by getting a sharp focus of a distant object, such as the sun, on a white card. The focal length is then the distance from the lens to the image on the card.

The spirit level can be purchased at any hardware store for ten cents. It should be about $1\frac{5}{16}$" long and about $\frac{5}{16}$" in diameter. One having the correct radius of curvature can be selected by comparing with an arc of the desired radius drawn on paper.

The radius of the level may be measured very accurately by the method illustrated in Fig. 3. Place the level on a stick and mark the position of the bubble. Raise one end of the stick and note how far the bubble moves. The radius of curvature of the level is then equal to the distance that the bubble moved, multiplied by the length of the stick and divided by the distance that the end of the stick was raised.

If the focal length of a lens is other than 5⅞", this design can be altered to accommodate it. If the focal length is less than this distance, the dimension (A) in Fig. 4 can be decreased accordingly, not altering the other dimensions.

If the focal length is greater than shown in this design, then the distance (A) must be increased. In this case the whole instrument will have to be lengthened to prevent vision interference. That is, the distance (D) in Fig. 4 must not be less than 1½". If the diameter of the lens mount is other than $\frac{1}{8}$" the thickness will have to be changed accordingly.

It will be difficult to secure a spirit-level with exactly the desired radius of curvature. However, deviation between this radius and the focal length of the lens can be as much as 10 percent without introducing gross error.

After a satisfactory lens and level have been secured, this design can be altered in accordance with what has already been said. The sum of the distances (A) and (B) in Fig. 4 should be made exactly equal to the focal length of the lens, even if this is not quite the same as the radius of the level. It is seen that the design is laid off in reference to two axes intersecting in a 45 degree angle.

The sextant shown has a wood frame consisting of two door-panel birch sides. Between them is sandwiched the white pine framework. This framework is glued to one side, the other side being removable and is held in place with wood screws.

Fig. 6 shows the block in which the spirit level is cemented with plaster of paris. This block is made in two parts glued together and then the whole block is glued into the framework.

A lighting system for the bubble is provided for use at night. This consists of a flashlight bulb, a socket, a low resistance radio rheostat and two penlight dry cells. The bulb, cells, and rheostat are connected in series by wires grooved into the framework.

Battery contacts are wood screws. One cell is put in upside down and the circuit across the upper ends is completed by means of a brass strip screwed on the lid. This lid is hinged and has a hook. It also has a ground-glass window for utilizing daylight.

There is also a piece of ground-glass between the bulb and the spirit-level. This ground-glass was prepared from ordinary window glass by first cutting it to size and then rubbing the two pieces together, using fine powdered emery and water as an abrasive. Emery can be secured at any hardwar store. The mirror below the level was cut with a glass cutter from a small plane mirror. It is secured by means of small brads in the corners.

(*Concluded on page* 64)

INDIANA STATE TEACHERS COLLEGE LIBRARY

FIGURE 1

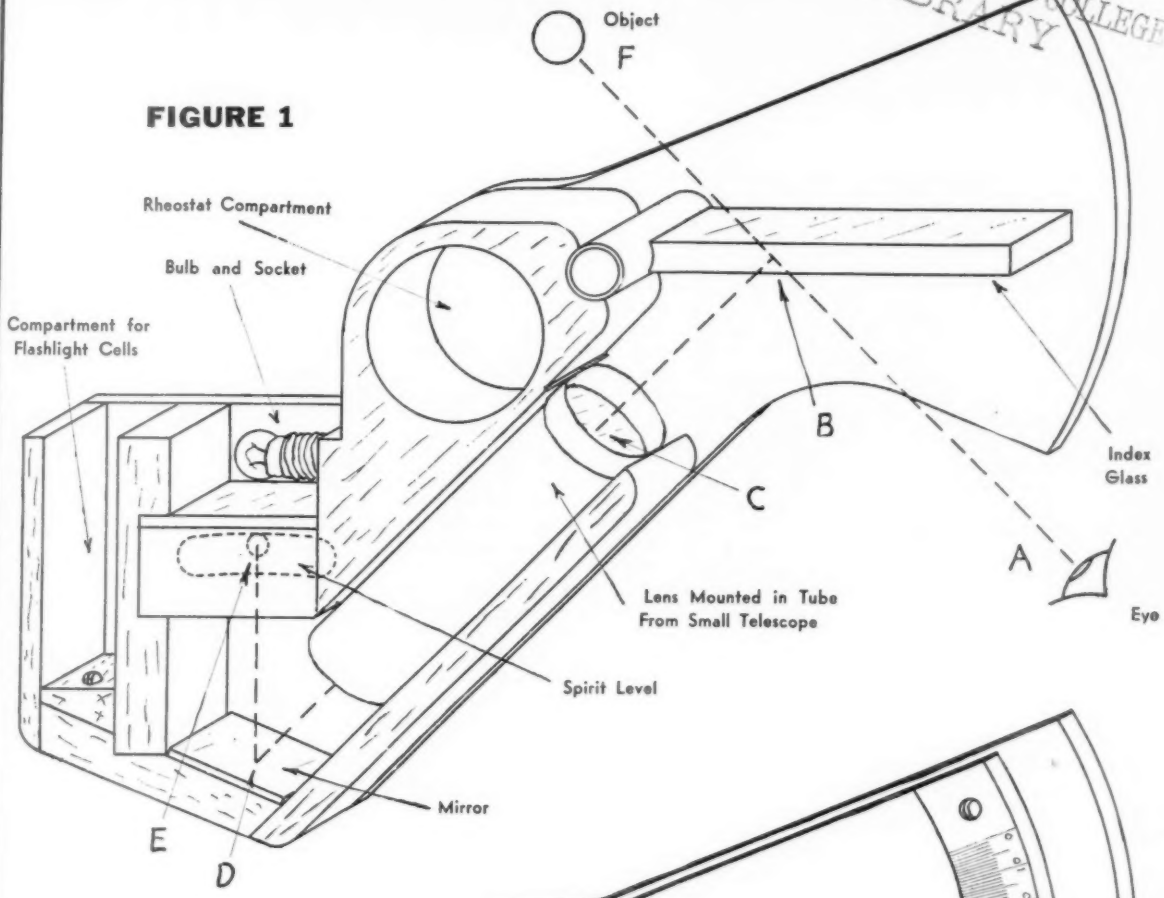
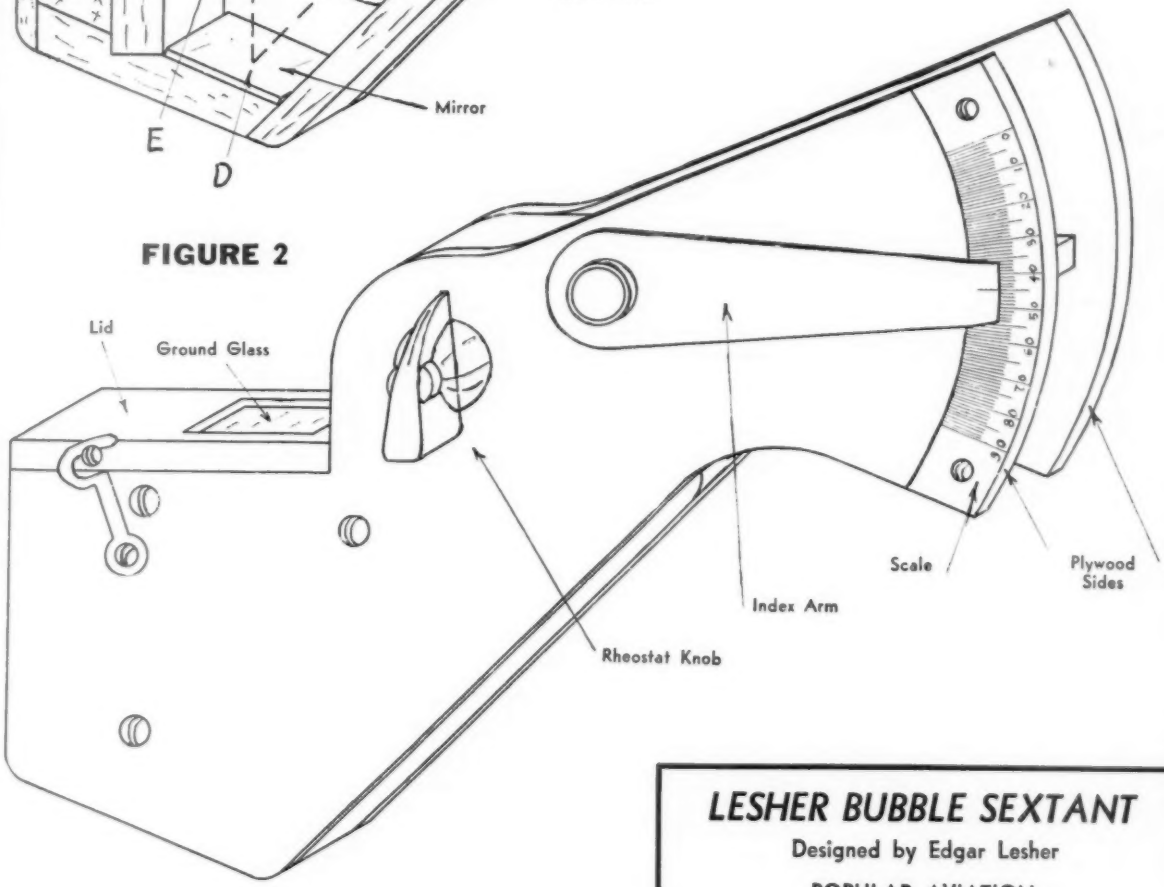


FIGURE 2



LESHER BUBBLE SEXTANT

Designed by Edgar Lesher

POPULAR AVIATION

July, 1938

Build Your Own Bubble Sextant

(*Continued from page 62*)

The brass tube of the lens mount is held in by friction. The index glass was cut from a piece of plate glass by means of a glass cutter. A slot was filed in a ½" brass tube and the plate glass was then cemented in this slot with plaster of paris. The brass tube then turns in holes bored in the two sides. Fig. 5 shows the object glass and its shaft.

Two brass washers are soldered to the shaft after assembly. They bear against the sides and center the index mirror. The index arm is cut from spring brass and is soldered to the shaft over the washer on the left side.

The scale is cut from thin brass and is secured with wood screws. It has 90 divisions which are actually one-half of a degree apart. However, as one degree of movement of the index glass corresponds to two degree's change in the angle of elevation being measured, these half degrees are labeled as degrees, and the scale is marked to read from zero at the top to 90 degrees at the bottom.

The scale may be laid off by means of a scribe, a straightedge and a large accurate protractor. The final adjustment is made in the following manner.

An observation is made on a distant object known to be on the same level as the observer's eye, the object being made to appear to coincide with the bubble by properly adjusting the index arm. An index mark is then scribed on the end of the index arm opposite the zero mark on the scale. The sextant is then ready to use.

A sun shade must be provided if observations are to be made on the sun. This can be made from a dark photographic negative and is placed on the sides over the object glass. It should be removable for observations on the stars and moon.

In order to take an observation say, on a star, the following procedure is followed. The rheostat is turned up so that the bubble is illuminated. The star is looked at steadily with both eyes and the sextant is held so that one eye sees the star through the object glass.

The sextant is then rocked until the bubble tube becomes visible by reflection. (The bubble itself will probably be out of sight in the end of the tube.) The sextant is now rocked with the right hand while the index arm is adjusted with the left hand, always keeping the tube in view and still looking steadfastly at the star.

The bubble will now come into view and may be made to appear to coincide with the bubble by proper fine adjustment of the index arm. The rheostat is adjusted so that the bubble is clearly visible but not too bright in comparison with the star. The angle of elevation of the star can then be read directly from the scale. With a little practice an observation can be made in 15 seconds.

The angle of elevation so determined can be used to determine the observer's position, using well-known navigation methods. Details of these can not be given here. However, details for determining the latitude at culmination of a celestial body will be given.

Select a star or the sun and with the sextant measure its altitude when it is on the meridian, that is when the altitude is greatest. This may be done by starting the observation a little before the meridian is reached, inching the index arm down as the object rises. The greatest reading before the object begins to dip can thus be got.

This angle of elevation is subtracted from 90 degrees and the difference is considered positive if the object were South of the observer, negative if it were North. This difference when added to the declination of the object gives the latitude.

The declination must be found for the time of the observation from tables such as are found in the *Nautical Almanac*. The declination and the latitude are considered positive north of the equator, negative south of the equator.

It is quite important that readers south of the equator in South America and Africa pay particular attention to the fact that the declination and latitude are negative in the southern hemisphere and that they make the necessary corrections.

For example, suppose that the angle of elevation of as star was 70 degrees and that it was north of the observer. Suppose that tables gave the declination of the star as 60 degrees north. Then the latitude is $-(90-70)+60=40$ degrees north.

END

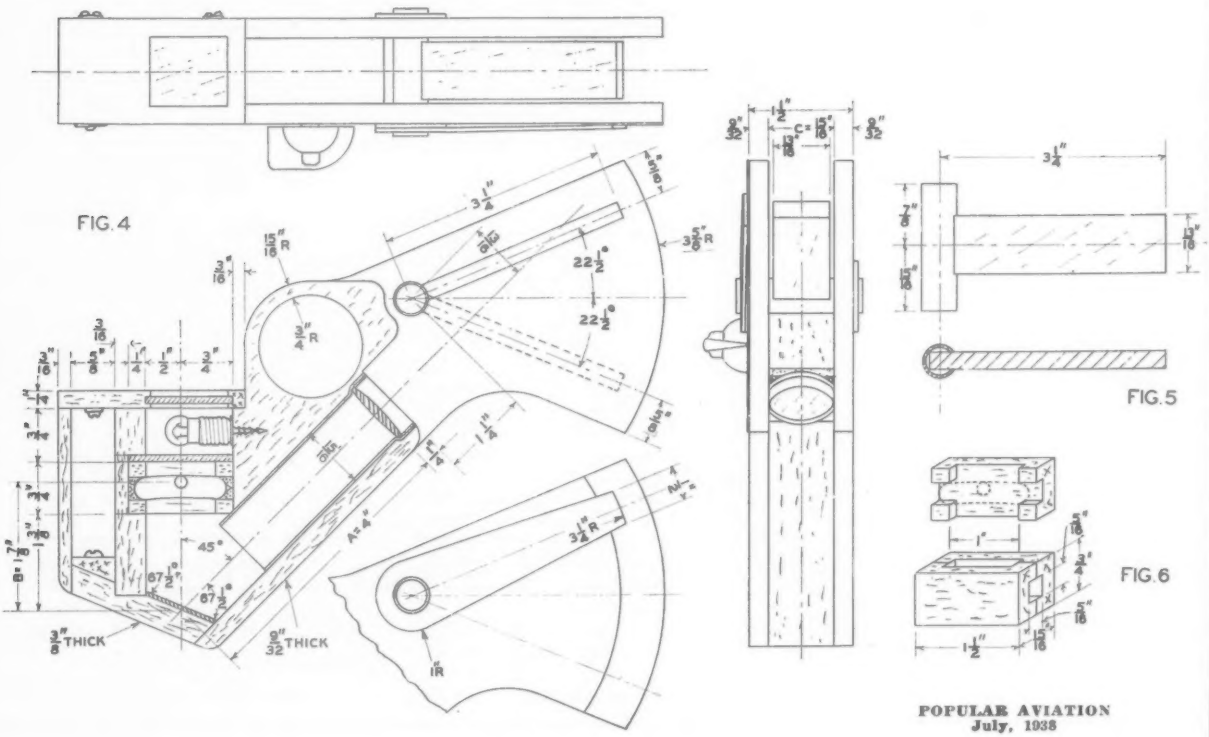


FIG. 4

FIG. 5

FIG. 6

"AIR BABIES"

by HELEN WATERHOUSE

An intimate sketch of the feminine author of a new aviation book. She aims at the juvenile population.

Miss Kalep points out salient features of "Air Babies."

OUT of the little known country of Estonia, where she dared old-world traditions to become the first woman flier of her race, there has come to American aviation and book publishing circles, recently, a brilliant addition in the person of Miss Elvy Kalep.

Blond and beautiful, this young woman who came to America in 1932 from her very small country south of Finland, as a German licensed airplane pilot, is now not only author of a new aviation book, but also a member of one of the largest air transport company's publicity staffs.

Her book, "Air Babies", is the first real primer of aviation ever published, it is said. Sporting across its wide and easily read pages are figures of her hero and heroine, gay little goop-like figures called, Speedy and Happy Wings. As they soar hither and yon through the clouds with their playmates, Gertie Glider and the like, they are destined to make the youngsters of the present generation highly airminded. Without any art training, Miss Kalep designed all of the illustrations herself and wrote the accompanying stories.

Miss Kalep's own life story reads like a tale of high adventure. After a daring decision to be the first woman to fly solo across the Atlantic back in 1932, much has happened to change this daredevil young foreigner into a successful American business woman.

And though she has a background of about 380 hours in the air, she rarely takes a plane aloft any more, though she travels hundreds of miles by air.

"I have more ideas about the future of air travel than a motor had revolutions", she says laughing. "And I believe my mission now is to make children and mothers as air minded as are the men of America."

To go back in the history of Miss Kalep, whose weakness today is "new and startling hats", she confesses, one goes back to the Red Revolution in Russia in 1917, when Elvy was sent to Petrograd in Russia, when her parents believed she would be safer than in her own country of Estonia. There she lived with an uncle who was traffic manager of the Far Eastern Railways.

Instead of finding a haven, however, she found herself plunged into the heart of the bloody revolution, and was even subjected to tortures by Bolsheviks, as well as seeing her uncle and two brothers killed before she escaped to her homeland again.

Miss Kalep can still describe the death of the first man in the Revolution, which occurred before her very eyes.

Later, after the Revolution we find her at St. Moritz, steering a bobsled with the skill of a man—a sport much more dangerous than flying, she has declared since. Anthony Fokker, Dutch plane designer, discovered her one day and told her that anyone who could pilot a bobsled as she did, could pilot a plane.

She took his advice, and went to Berlin to become a student flier.

Later she went to Holland and became a voluntary pilot for the Royal Dutch lines between Amsterdam and Cairo. Sometimes on those early commercial flights she was in the air for as much as eight and a half hours at a stretch. It was after her German air career that she conceived the idea of coming to America to cross the ocean by air in her own plane. She even got as far as buying a Bellanca and was in the act of equipping it for the epoch-marking flight when Amelia Earhart "beat her to it".

"I was heartbroken", she relates. "But Amelia and I became good friends afterwards just the same, and she wrote the foreword for my book and gave me her picture to go in it, shortly before her world flight."

Miss Earhart's foreword in "Air Babies" reads thus—

"When last I surveyed the field of children's aviation literature, I found very little indeed for the very young. Yet everyone in the industry knows, this extremely youthful group is the most important of all the citizenry as concerns airplanes and air travel. They take both so entirely for granted that while they sometimes nonplus their complex-ridden elders, they are the pride and joy of America.

"Authors have usually been content to talk down to these important people, by preparing them simplified tales of their older brothers and sisters air heroes. However, Miss Kalep has invented some winged characters, with whom they should be much more at home than with the George Washington and Abe Lincoln of flying. She is a pilot herself, so her 'Air Babies' commit none of the technical errors so revolting to well informed children.

"May these two—'Air Babies' and children—be warm friends." Amelia Earhart.

"It's all part of an educational program, you see", explains this girl who speaks seven languages fluently. "I am even having my 'Air Babies' made up into dolls by an Akron, Ohio, rubber company. And I have had some flying suits for children manufactured with my 'Air Babies' embroidered on the shoulder, 'Speedy' for the boys, and his girl friend, 'Happy Wings' for the girls."

When United Airlines officials saw the book, "Air Babies", they immediately put their stamp of approval on it, and asked Miss Kalep to tie up with their line. Her headquarters are in New York city.

And this just goes to show how many opportunities have been passed up in aviation literature—literature of the non-technical variety that is really of importance. Perhaps the same idea, in more romantic form could be made to interest still another band of future airline patrons—the home people of the smaller towns such as Main Street.

The aviation wise may smile at child interest in aviation, but the tots of today are the cash customers of the airlines tomorrow and inspirational literature appealing to childhood lives through the lifetime of that person.

At least, that's the attitude of the various airlines with which Miss Kalep has dealt. With few exceptions, the lines have cooperated whole-heartedly with her. Knowing full well that to have the children in the family talking about their companies is invaluable advertising.

END

Propellers Without Formulae

Part II

by RAOUL J. HOFFMAN

In this second article on propeller specifications, we publish the self-computing alignment chart that was mentioned in the June issue of POPULAR AVIATION. Keep this chart for future reference and use.

IN the June issue of POPULAR AVIATION, the basic principles of airplane propellers was taken up briefly but in such a manner that the controlling factors were substantially described.

In this issue we go further into the matter and show an accurately drawn alignment chart by which design data can be obtained without the usual tedious and time taking "hand-power" calculations ordinarily employed on this sort of work. And, better still, this chart is not only adaptable to large full scale propellers but to model airplane propellers as well.

While this chart may appear very complicated and difficult to understand, at first glance, yet it is really very easy to operate with but little practice. The elements of the chart are placed in the proper consecutive order and the problem is solved by following across the page from left to right. For a full understanding of the chart, a problem is worked out as indicated by the dotted lines on the face of the chart.

The problem to be worked out is the design of a propeller for a 50 brake-horsepower engine, turning at 2,500 r.p.m. with the plane flying at 90 m.p.h. For convenience, each scale is given a reference number in a circle to distinguish the figures from the numerical values.

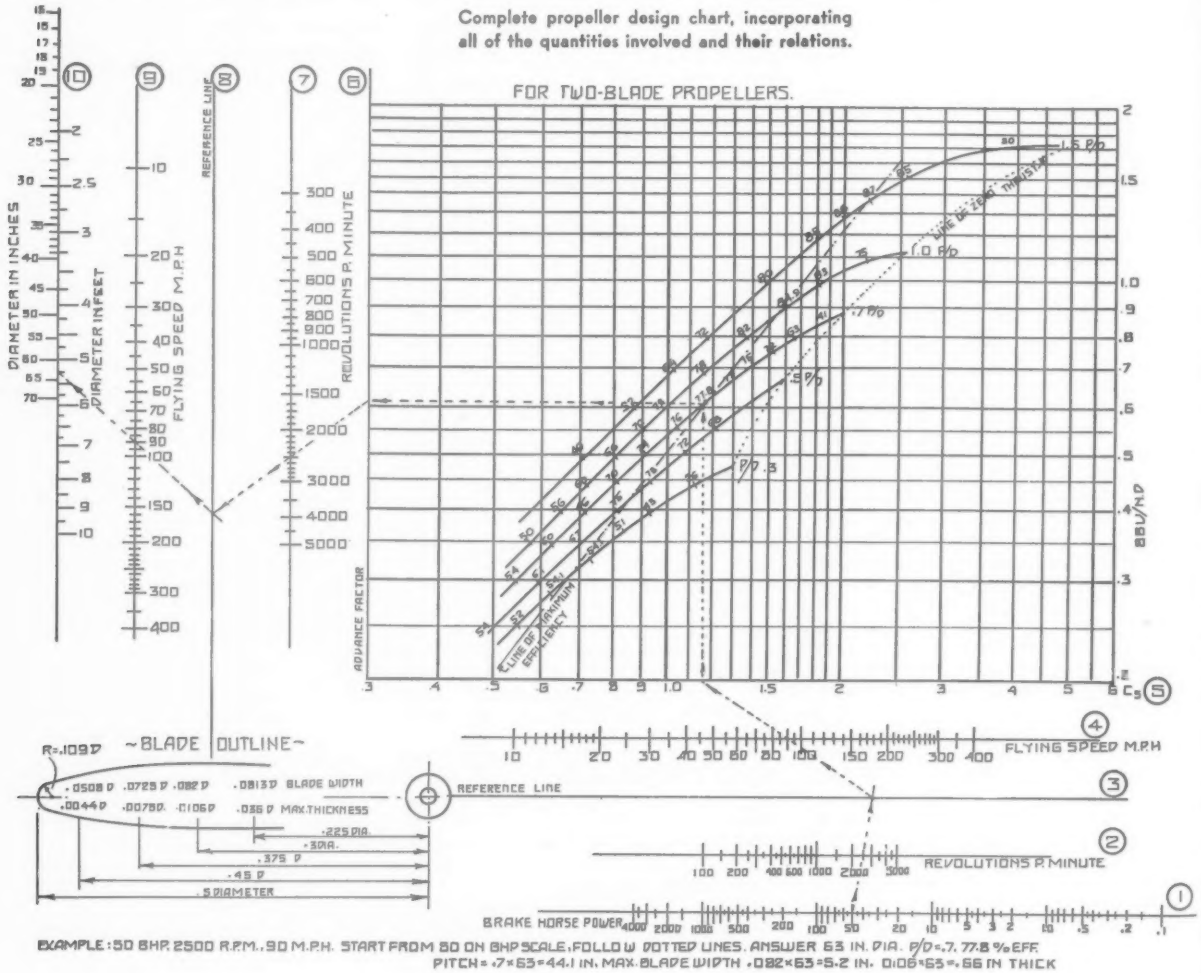
Starting with scale (1) at the bottom of the chart at the given 50 b.h.p., and projecting the dotted line through the required 2,500 r.p.m. on chart (2), we allow the extension of the line to intersect on reference line (3).

From the point of intersection on (3), draw another dotted line to the required 90 m.p.h. flying speed on the chart (4) and thence project the line to line (5) on the large chart above it. Next, up vertically to the slanting dot and dash efficiency line, the intersection taking place on the curve, showing an efficiency of 77.8 per cent.

Next, across the chart horizontally to the left to the vertical reference line (6). From this intersection draw the dotted line through the 2,500 r.p.m. vertical reference line (7) and then project the line until it cuts the vertical line (8).

From this intersection, draw a line through the 90 m.p.h. flying speed on reference line (9) and extend the line to vertical (10) where it will be seen that the required propeller diameter is 63 inches. Multiply the diameter by 0.7 to obtain the pitch of 44.1 inches. The blade width and similar dimensions can be worked out from the sketch in the lower left-hand corner.

Complete propeller design chart, incorporating all of the quantities involved and their relations.



EXAMPLE: 50 BHP. 2500 R.P.M., 90 M.P.H. START FROM 50 ON BHP SCALE, FOLLOW DOTTED LINES. ANSWER 63 IN. DIA. P/D=.7. 77.8 % EFF. PITCH = .7×63=44.1 IN. MAX. BLADE WIDTH .082×63=5.2 IN. 0.106×63=.66 IN THICK

MEAN AERODYNAMIC CHORD

by CONRAD J. MORGAN

A simplified method of dealing with the calculations incident to a taper winged, low-wing plane. This will prove of great value to the amateur who is frequently stumped by the complexities of the tapered wing.

MANY of you homebuilders have, no doubt, contemplated building a low-taper-wing ship but were stumped on the problem of locating the center of gravity.

You knew that the center of pressure moved through a greater distance at the root of the wing than it did at the tip because the chord was greater. You also knew that the center of gravity had to be forward of the center of pressure to secure the proper stability.

But you did not know just where to place the center of gravity in relation to the root chord to insure it being in the proper relation to the center of pressure. To accomplish this we find the mean aerodynamic chord and place the center of gravity in the proper relation to it.

The mean aerodynamic chord, m.a.c., of a wing is the chord of an imaginary wing not necessarily having the same planform but having the same force vectors through the flight range as the wing you are using. This may seem confusing and rather unnecessary at first but when you consider the case of the taper wing, the logic of the whole thing is immediately apparent.

A suggested planform with formulae giving the chords, span, length and position of the m.a.c. is shown in Fig. 1. Suppose you want 150 square feet wing area and wish to find the dimensions, using the formulae given in Fig. 1.

S, (wing area) = 150 square feet. C_c (root chord) = $\sqrt{\frac{150}{3.719}} = \sqrt{40.33} = 6.35$ feet.

C_t (chord of equivalent tip) = 6.35/2 = 3.175 feet. Span of complete wing = $4.724C_c$ = 29.99 or 30 feet.

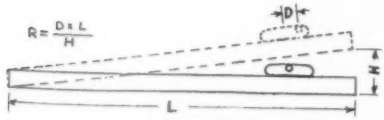


FIG. 4. Demonstration of H.

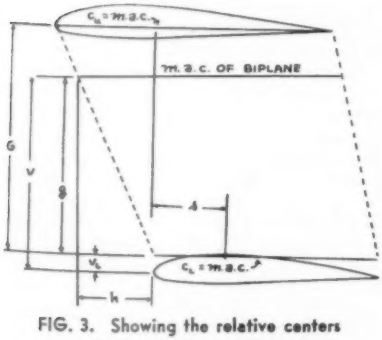


FIG. 3. Showing the relative centers on a biplane of staggered form.

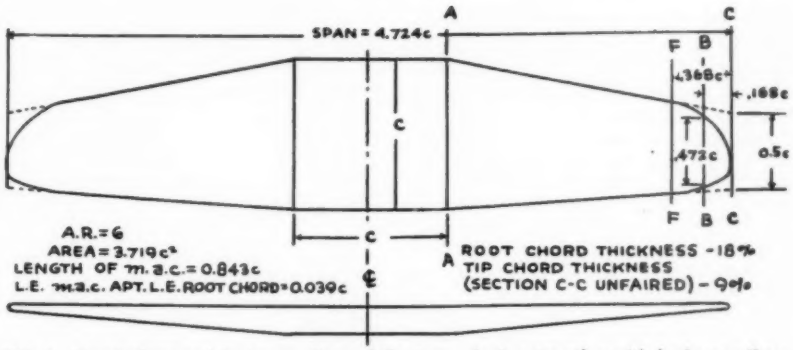


FIG. 1. Terminology and basic equations of the tapered wing, together with basic equations.

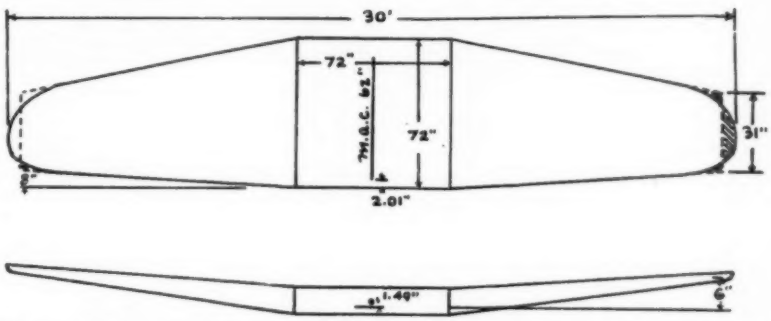


FIG. 2. Specific dimensions applied to the low-wing problem worked out in this article.

This gives an aspect ratio of 6.0. The m.a.c. then will be 0.843C_c or 5.35 feet in length and will be 0.039C_c or 0.24765 feet from the leading edge.

But suppose you do not wish to use this standard planform. In this case you will find the length and position of the m.a.c. by the following formulae.

In Fig. 2 we have a wing of 26 foot span with a root chord of 72 inches and a tip chord of 31 inches. The tip displacement due to sweepback is 8 inches and the tip displacement due to dihedral is 6 inches.

C_c = 72 in. (chord of center section)

C_t = 31 in. (equivalent tip)

$C_p = 2/3\ (72+31-\frac{72\times31}{72+31}) = 54.2$ in. (m.a.c. panel)

P = 8 in. (displacement due to dihedral)

$M = 8\ \frac{(72+2\times31)}{3\ (72+31)} = 3.7$ in. (panel m.a.c. displacement due to sweepback)

D = 6 in. (tip displacement due to dihedral)

$N = 6\left(\frac{3.7}{8}\right) = 2.76$ in. (panel displacement of m.a.c. due to dihedral)

S_p = 43 sq. ft. (area of panel)

S_c = 36 sq. ft. (area of center section)

m.a.c. = $C = \frac{(54.2\times43)+(72\times36)}{43+36} = 62.3$ in. (m.a.c. of wing)

$h = \frac{3.7\times43}{43+36} = 2.01$ in. (horizontal displacement of m.a.c.)

$v = 2.76\left(\frac{2.01}{3.7}\right) = 1.49$ in. (vertical displacement due to dihedral)

It should be noted that the vertical displacement is taken from the reference chord of the wing and not from the bottom of the rib. The vertical displacement due to dihedral is measured the same way.

The equivalent tip (mentioned earlier) is merely a square tip formed by the continuation of the leading edges and trailing edge having the same area as the actual tip. This equivalent tip then will be shorter than the actual tip.

It should be remembered that the m.a.c. is to be drawn parallel to the reference line of the ship and not parallel to the chord of the wing. In other words, the m.a.c. has no incidence.

Finding the m.a.c. for a biplane isn't so simple as that for a monoplane. So, to clarify the process, the equations and formulae used here will be set down barren of any concrete figures and then be used in a hypothetical case. You can then substitute the figures of your ship with greater confidence.

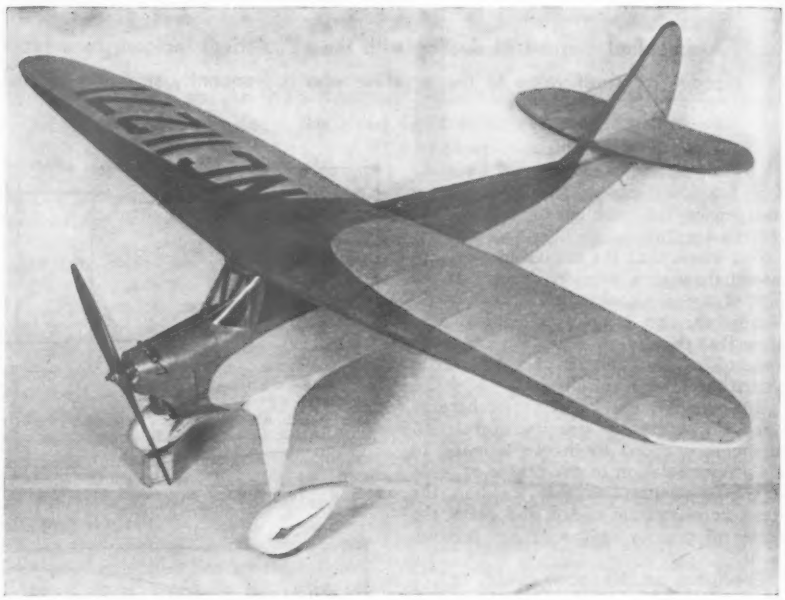
The first step is to determine C_u, the m.a.c. of the upper wing and C_L, the m.a.c. of the lower wing (separately) as for monoplanes, using the method outlined above. The next step is to determine e, the relative

(*Continued on page* 89)

A New Gas Powered Model

by

PAUL W. LINDBERG
Model Editor and Designer for
POPULAR AVIATION



The exceedingly clean lines and the accurate distribution of the surfaces of this model make it both an efficient and stable gas-powered model that is easily constructed. Note the neat distribution of the power-plant.

THIS tiny gas model has turned in many an interesting flight powered with the famous little *Hornet* motor. Being of such small size it is very conveniently carried around. A very clever and helpful idea has been built into the wing so as to prevent any damage to the ship if it should strike some unseen object. Should the wing tip strike the ground first, it will pivot at the center of the wing which in turn is held to the body by a long bolt.

The full shock absorbing landing gear is very simple to construct as well as being adequately strong to stand the severest landings. The model as a whole has been designed so that a beginner may construct it with few difficulties. At the same time the beauty plus graceful lines together with its excellent performance were very important factors considered while building the model. Suggested color scheme for this model is yellow trimmed in red.

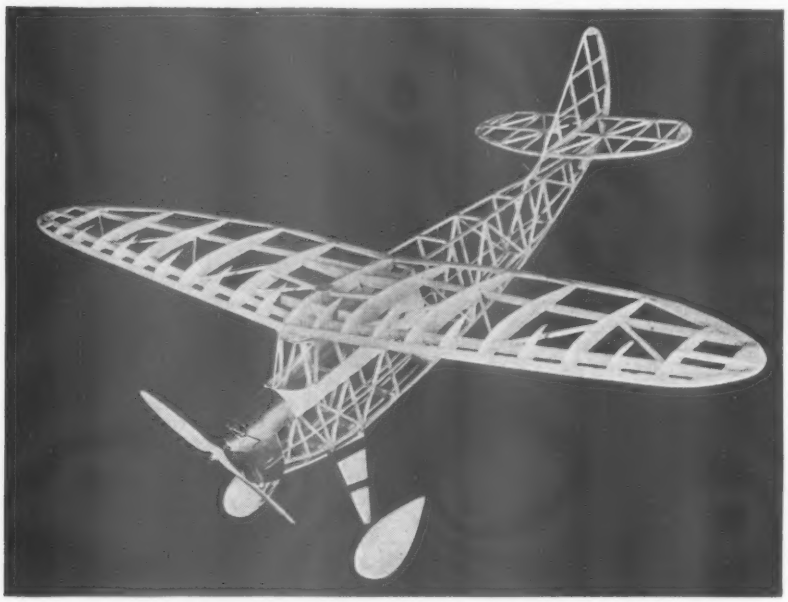
Note: If the motor is to be installed in the model in an inverted position, more difficulty will be encountered. It is very important that the gas tank and motor are installed exactly as shown on plan in order to secure the maximum results. It is also very important that you do not choke the motor so as to get gas down into the cylinder which in turn shorts the points in the spark plug. We advise mounting the motor on a test block. Experiment with it in this position so as to familiarize yourself with the starting. When mounting your motor in an upright position, such great care need not be taken.

Construction of Fuselage

The main longerons of the fuselage are of strong ⅛ inch square balsa. Place wax paper over the plan to prevent the fuselage sides from sticking to the drawing. After the two fuselage sides have been constructed, cross members are next cemented in place. The tail pieces of the fuselage is comprised of a solid piece of balsa. Fire wall is made from 3/16 inch thick veneer.

All formers are cut from 1/16 inch thick sheet balsa and are cemented in their proper locations. 1/16 x ⅛ inch stringers are attached and spaced evenly about the formers as shown in the front and side view of the plan. Photo of the framework clearly shows all extra bracings, etc., built into the fuselage.

The rear part of cabin is left open so that the batteries may be adjusted on the sliding rack. By increasing the plans four times the size shown, the exact size of this model will be had.



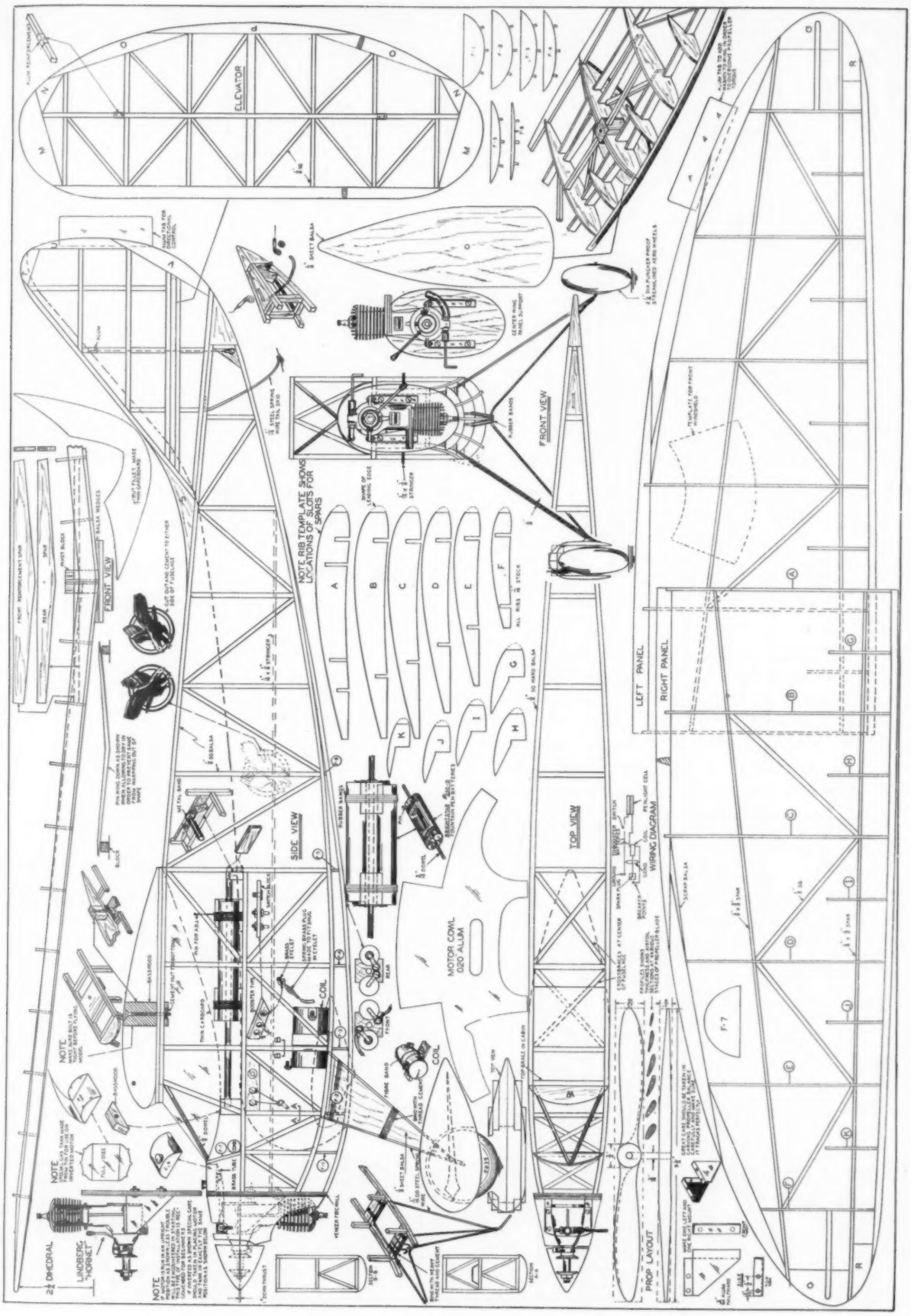
The frame-work of the model is sturdy and of such form that it can be easily maintained in exact alignment.

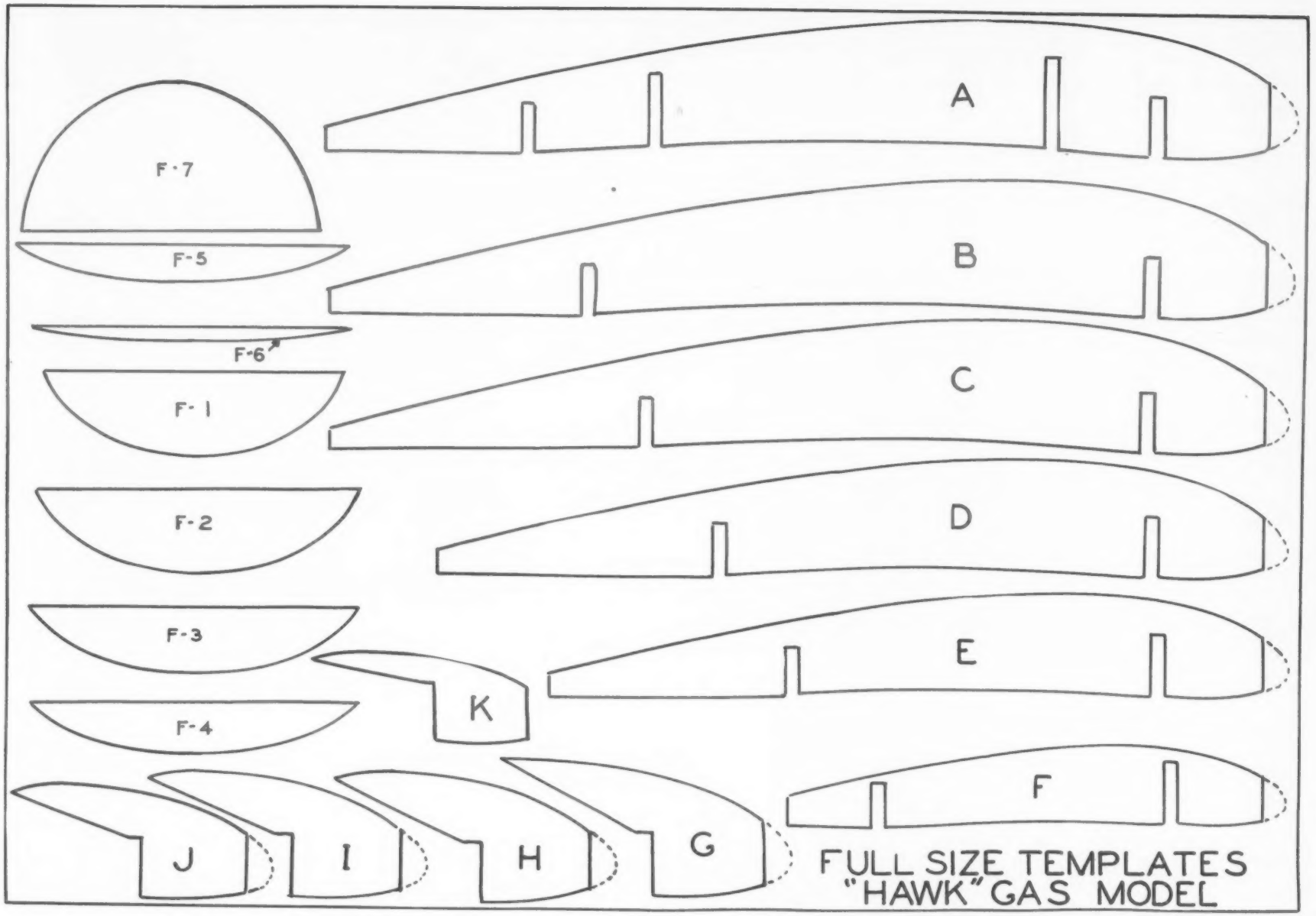
Construction of Landing Gear

The type of landing gear used on this model is very simple to construct. It consists of three pieces of 1/16 inch spring tempered steel wire. The front outer piece forms the axles for the wheels and continues up into the fuselage where it is securely bound with heavy thread and cement. The rear wire is bound to the front wire and continues up and across the bottom of fuselage. The spreader piece is also bound to the bottom of landing gear and is hooked at the top with a series of small rubber bands so as to give it a more rigid type of shock absorbing effect.

Fill in the space between the 1/16 inch landing gear rods with ⅛ inch sheet balsa. Carve and sand to a streamline shape then cement and bind with thread

(*Concluded on page* 80)


ELEVATOR
FRONT VIEW
SIDE VIEW
TOP VIEW
NOTE: RIB TEMPLATE SHOWS LOCATIONS OF SLOTS FOR SPARS
A
B
C
D
E
F
G
H
I
J
K
LEFT PANEL
RIGHT PANEL
WIRING DIAGRAM
PROP LAYOUT
MOTOR CONL
020 ALUM
2½ DIHEDRAL
LINDBERG HORNET



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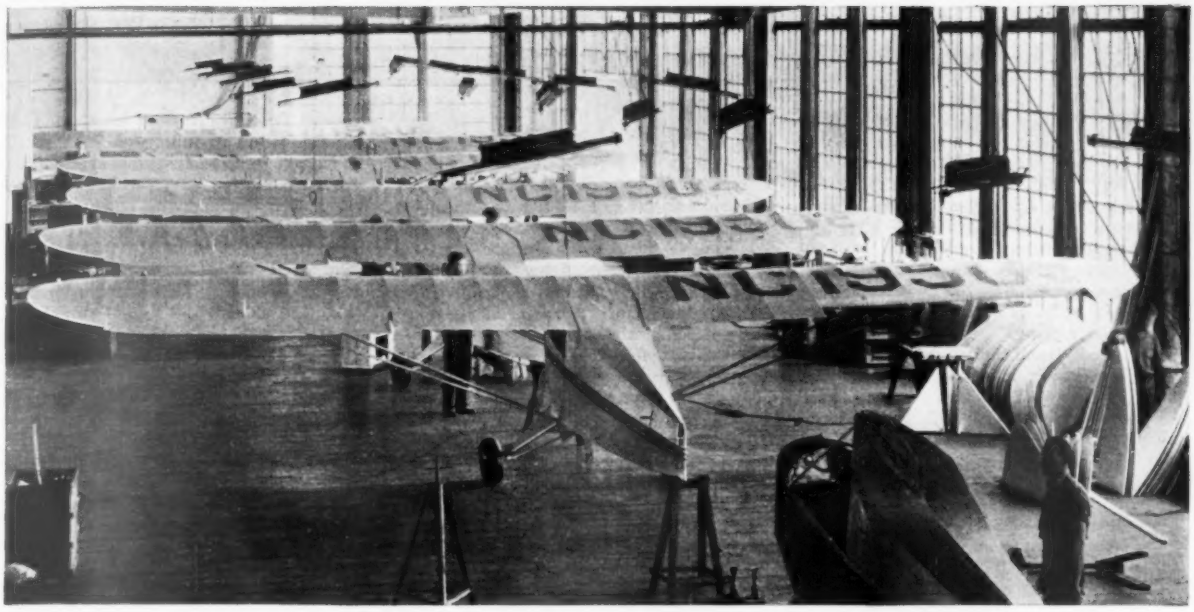

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CUB TRAINER $1270 F. A. F. Factory **$425** DOWN

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THE WORLD'S FASTEST SELLING AIRPLANE

Is America Vulnerable to Air Attack?

(*Continued from page* 14)

They say: "What have we to fear? We have the Atlantic ocean on one side and the Pacific on the other. To the north lies Canada, a very friendly nation, and to the south a puny republic known as Mexico. Who could or would dare attack us?"

Somehow, they never ask why.

All right, we have the Atlantic on one side and the Pacific on the other. There's about 3,000 miles of water between the east coast and Europe and about 6,000 between the west coast and Asia. That's a lot of water in which to hide an enemy fleet, and if we can believe the reports on war games, the boys have a tough time finding each other even when they are not playing for "keeps." There is no reason in the world why air attacks of major importance could not be staged from the decks of carriers. Or they can use some of the long-range flying boats we may sell them, and make a swell job of it.

Can you imagine a fleet of PBYs in the hands of a hostile force bombing New York or San Francisco? What a swell time the anti-aircraft gunners will have sorting friend or foe. Or let us suppose they decide to use a few American Vought *Corsairs*. Won't our defensive fighters have a pleasant evening wondering which belong to the Navy and which came just for the ride?

So an enemy force could bomb the United States and get away with it. They could stage several raids at the same time and make things very unpleasant. A series of raids carefully timed and focussed on the proper targets might break down the whole system of defense. Their ambassadors, who are so renowned for their notes of regret might do an about-face and say: "Well, there are you. You see what we can do, and what we have done, now will you consider your immigration laws as related to the West Coast?" Or, it may be something about forgetting the Monroe Doctrine. They may even pointedly suggested that we forget our possessions in the Pacific or our foreign trade in Europe.

That's the way wars are carried out in 1938. They don't bother about a formal declaration of war. Things happen quickly and someone is left asking questions, just as someone did when the *Panay* was sunk.

But why? Why will this hypothetical foreign power do all this bombing business.

The answer is most simple.

The reason America is so vulnerable to air attack is because we have been so considerate as to place practically every major target, every important munitions center, every focal point of business and government just where enemy raiders can get at it with the least possible effort.

For instance: practically every aircraft factory of any importance has been thoughtfully placed near a coastline or a border. To start off, Boeing, Douglas and Consolidated are all on the west coast. Lockheed is at Burbank, California. North American Aviation has been conveniently placed at the Los Angeles municipal airport. They make observation ships and trainers. Northrop, who make our A-17 attack ships, also is located at Burbank, and is a subsidiary of Douglas. Vultee, which manufactures attack-bombers for the Army (and for export), is nicely set at Downey, Cal.

Other important concerns are conveniently placed on the east coast. Vought, for instance, is located at East Hartford, Conn., fully 40 miles from the Atlantic coastline. Sikorsky is planted at Bridgeport, smack on the shore. Seversky, Grumman and Brewster are thoughtfully placed on Long Island while Bellanca and Martin are quaintly hidden along the shores of Chesapeake Bay.

Bell and Curtiss have selected Buffalo on the south shore of Lake Erie, or conveniently close to the Canadian border, but Stearman

"Hey, sonny. What time is it?"

—as, Stearman who make trainers; they're taking no chances on Stearman. That plant is located at Wichita, Kansas.

But let's go back to the west coast again.

Only recently the San Francisco *Examiner* thoughtfully published a full page colored map of the West Coast showing in full detail all the vulnerable points accommodatingly planted for foreign air raiders. For instance, in the 'Frisco area there is the Mare Island Navy Yard, Hamilton Field, the Army base at Alameda, Crissy Field and the two new bridges, which, if destroyed, would bottle up all naval and commercial craft in the bay.

Around Los Angeles the map pointed out the vast undefended coast line near Ventura which would be handy for landing troops—or planes. Then there was the all-important Los Angeles aqueduct, the vast oil-tank farms near Fort MacArthur and the unprotected high tension line supplying Los Angeles with current and power from Boulder Dam. March Field is nearby and Fort Rosencrans and San Diego lie to the South.

All perfectly laid out for raid targets.

Yes, the United States is very vulnerable to air attacks.

Let's go back east again.

The national capitol at Washington would be a pushover for a raid staged from a point off the shore of Maryland. So would Baltimore and the naval base at Newport News. To move further north and still keeping within a bullet-shot of the coast we have Philadelphia and New York. North of that we have the industrial centers in New England which includes the all-important Colt machine-gun factory in Hartford, Conn., the only factory in the country capable of turning out a modern aircraft weapon. Two years ago, floods wallowing around the second story of the factory; put them out of business for about a month, but no one thought anything about it. They were too busy turning out bakelite corks for the tops of medicine and whiskey bottles to worry much about machine guns.

There's an important ship yard at Fore River, Mass., and a naval base at Newport, R. I. There's a Navy Yard at Brooklyn and another at Philadelphia. The Bethlehem Shipbuilding Corporation, which is now building an aircraft carrier, *Wasp*, to replace the *Langley*, is located at Quincy, Mass. There's a navy yard at Boston, another at Charleston and another at Squantum, Mass.

How can enemy raiders miss?

Right near New York City at Bayonne, New Jersey, is a monster oil tank plant where millions of gallons of high grade gasoline is stored. There's another just up State Island Sound at Bayway where millions of gallons of gasoline are distilled and stored. There are dozens of such plants all along the coast, and no one does anything about it. But someone will some night, with a nice yellow 112-lb. bomb, and all their Foamite fire-fighting devices won't stem the flood of flame which will roll out like a golden ocean and consume everything in its wake. I have an idea that there's enough gasoline stored at Bayonne to flood across the North River and set the whole of New York City on fire.

There's a nice ordnance testing ground at Aberdeen, Md., but they won't have a chance to get one of their new guns mounted if the raiders ever open up. Our submarines are made at the New London Ship and Engine Works at Groton, Conn., and it's perfect for a dark night.

It's quite true and obvious that shipbuilding firms must set their plants on the water, but the effectiveness of aerial bombing has been an open secret for more than 20 years. Surely in that time, many of them could have been moved farther up river mouths, bays or along open inland waterways. As far as the aircraft factories are concerned, there is no excuse of any sort why they have been placed where they are. There is no excuse for placing the great Army powder works near Dover, New Jersey, only a few miles from the heart of New York City.

But how important would one of these raids be? What would it mean? How much

(*Continued on page* 74)

The Birdmen's Perch

LIARS ATTENTION! We believe that every honest, law-abiding citizen has a secret conviction that he alone can spin a taller story than anybody within listening distance. Opportunity knocks! The Whopper Club invites you to let off steam on the marvels of Gulf Aviation Gasoline—reprints the best every month—and sends the author a specially printed certificate of membership! Forward whoppers to:

MAJOR AL WILLIAMS, alias "Tattered Wing-Tips," Mgr., Gulf Aviation Products, Gulf Bldg., Pittsburgh, Pa.

FOR PUZZLERS ONLY

Dear Tattered Wing-Tips: How about catching some of your puzzle artists and mathematicians on this one:

Two planes start at the same time at the same point, and race round-trip to a distant point. If the air were still, the faster plane would have twice the speed of the slower plane. Actually, the faster one reaches the distant point, turns, and is ⅓ the way home again before the slower plane passes, still on the way out. What is the velocity and direction of the wind? **—C. L., Brooklyn**

(T.W.T. will check your solution for you. Just mail it in!)

VENGEANCE DEPT.

Dear T.W.T. Keep up the good work. The Problems have my physics teacher on the run. I'm getting even for the last two tests he gave. **—Paul Gooderum**

"SAFEST" AWARDS TOP RECORD STORIES

There are some mighty fine stories buried in the recent announcement of awards of the National Safety Council.

These certificates of merit for "Outstanding Contributions to Safe Air Travel" went, among others, to the Eastern Air Lines and to the Pennsylvania Central Airlines.

Birthday

April 27th happened to be P.C.A.'s birthday. And on it they celebrated, not merely a single year without fatalities, *but 11 solid years, since they began to serve the public, without ever a single fatal accident to a passenger or a member of a crew!*

Extra credit was due to Eastern Air Lines, too, for this year's award to Eastern followed their previous year's record of topping all "bests" for that period.

A Matter of Pride

Gulf takes its hat off and bows all credit to these two companies. But we're prouder than punch that Pennsylvania Central Airlines has been using *Gulf Aviation Gasoline* exclusively, for many years—and that Eastern Air Line's record was made with both Gulf Gas and Gulf Airline Oil. (Since January, both are 100% Gulf Gas *and* Oil!)

Eddie Rickenbacker

In signing off we want to wish both lines the best of luck—especially to Capt. Eddie Rickenbacker and his associates who have just taken over Eastern Air Lines. **—EDITOR**

WHOPPER CLUB

The Whopper Club's diploma for the month goes to Charles E. Kerr, his whopper having been deemed most worthy of reproduction on this page. He takes issue with Dorothy Tibert's whopper, wherein "grandma" got rubbed with Gulf Aviation Gasoline instead of linament (she soloed about the house until she ended up in broken china, under the bed. Remember?)

**"She'd have soloed on to heaven
Up among the stars so white . . ."**

THIS MONTH'S WHOPPER

Ah! Miss Tibert, what a whopper
That you wrote at Aroostook,
Telling us of grandma's cropper
And her aeronautic fluke—
How she soloed to the ceiling
Through the room and round about,
How she sailed back to her boudoir
Absolutely cured of gout!

All because *Gulf Aviation*
You did rub on every joint . . .
Let me tell you, dear Miss Dotty,
That I think you missed a point!
Had her tanks been filled with *Gulf Gas*
As she flew on out the door,
She'd have shook her tail-skid at you
As you turned to see her soar!

She'd have made no chinese landing,
She'd had power to spare galore.
She'd have not received your panning
'Bout the china on the floor.
She'd have soloed on to heaven
Up among the stars so white,
And to shame she'd put the swallow
And the eagle in their flight!

As it was, she made a landing
On the floor, in broken glass—
Proving that it wasn't GULF—but
Just some ORDINARY gas!

—C. E. Kerr, Richmond, Virginic

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GULF AVIATION PRODUCTS

Is America Vulnerable to Air Attack?

(*Continued from page 72*)

actual damage could be caused if a fleet of raiders attacked the City of New York, Washington or a navy yard at Boston?

The ballistics experts tell us that it would take hundreds of giant bombers carrying missiles weighing tons and loaded with the most effective explosive to destroy a modern city. By that, they mean actually raze it to the ground. They tell us it will take hundreds of gas containers to wipe out a city.

One is a fool to attempt to laugh off the effect of the modern aerial bomb. One has only to go back to the war history books to see the devastation created by the 25-pounders, 50-pounders and 112-pounders that were deposited on railway stations, dumps and bases to realize what the aerial bomb of 1938 can do. New explosives, better casing design and more efficient detonators make it one of the most deadly weapons known to civilization. Only those who set themselves up as historians and arm-chair experts attempt to deride the value of the air bomb. It is quite obvious that they have never been anywhere near when one exploded, or their opinions would be completely reversed. Certain tests were made recently in Great Britain to discover the actual effect of the modern aircraft bomb on a model of a section of London. The result was so terrible that the facts were quickly and carefully locked away.

To laugh off the effect of gas is another gigantic and criminal mistake. Lieut.-Colonel Boelke, the noted German chemical warfare expert, recently stated that the consequences of a modern gas attack on a densely populated town immediately brings panic, the most terrible of lung diseases, terror to the population and various types of poisoning resulting from the mixture of different gasses. General Sir Reginald Hart, a noted British authority, has declared that aerial gas attacks on any large city would result in the complete annihilation of the population. Millions of human lives would be lost in a few hours. Professor Cannon of the Harvard Medical School has stated that nothing yet known is comparable to gas attacks from the air in the destruction of industrial centers and the mass murder of the civil population.

Three drops of Lewisite are enough to kill a grown man, if they come in contact with his skin. Lewisite is also known as "Death Dew." It was known to the Allies in 1918 but they hesitated to use it, so terrible was its effect on those who fell its victims.

Phosgene and trichlormethylchlorformate (or Cl.C00.CCl_3 if you must be technical) is better known as Green Cross gas. This little concoction has the effect of "dry land drowning." The walls of the capillaries and vesicles of the lungs, the latter being essential for the renewal of the air for breathing, become pervious to the liquid components of the blood. What happens? The lungs simply fill up with blood and you die a gradual and painful death, drowned in your own blood. Only a few drops required too, remember. Not a tank full.

There's another little sniffer-out known as chloropicrin. (CCl_3NO_2) causes oedema or dropsy of the lungs. There are other complications with the use of chloropicrin just in case you have dropsy of the lungs. It will also give you dropsy of the spleen and cause necrotic changes in the vascular walls.

Dichlorethyl sulphide is sometimes known as Yellow Cross or Yperite. It is a form of mustard gas which is delivered through a spray. They make bombs which spray it, only it is invisible and when you get a dash of it—you're done. It clings unseen to your clothing, soles of your shoes and when you go indoors where the temperature is a little higher it moves around on its own. Then you and the rest of your family breathe it in, or it clings to the outer skin, but nothing happens for from 6 to 18 hours. Then the first symptoms appear when necrosis of all membranes such as the mucous membrane, the eyelids, the cornea of the eye, the bronchial tubes and the lungs takes place. Eventually, over a period of weeks the victims are strangled.

There are several more we know about, all equally as deadly and effective under their particular conditions. These have been known since about 1927, and we can only surmise how they have improved them in the last ten years.

We have seen then that the potential enemy can get the ships to make these raids. He has a wide variety of targets to select from and he no doubt has the projectiles to release when he gets there. The only question we have not answered is: Why should he attempt this?

No clear-thinking reader will of course assume that a complete victory over the United States can be won in this manner. The most enthusiastic believer in the air arm attempts to prove that a major conflict can be won without the use of ground troops, who must take over the area involved. In other words you can't win anything without the infantry foot-slogging into it and setting up headquarters.

What one raid *will* do is to throw the country into a war. A war in which the United States would have to hitch up its britches, pick up a gun and climb aboard a transport. The war may be 3,000 or 6,000 miles away, but it will have to be fought, in spite of all the smug assurances that "we won't take any part in a war of aggression."

A single air raid on San Francisco, San Diego, Chicago (via the North Pole route perhaps), New Orleans, Washington or New York would be cause enough. A hundred million people would be up in arms. The radio chains would broadcast the gory details over wide networks. The newsreels would bring the pictorial evidence to quarter of a million neighborhood theatres and the newspaper headline writers would have a field day.

Look what happened when a Japanese bomber sank a ninth rate river gunboat in the Yangtze. The *Panay* was nothing much more than a Chinese junk powered with a steam engine. It was actually built in the Kiangnan dockyards in Shanghai and did 15 knotts an hour going down river. But it was flying an American flag and it was bombed and sunk. If the motion pictures of the event could have been shown on an American screen within 24 hours, this country would have been at war with Japan by now. As it was, they came as an anti-climax, and only added to the blanket of mystification that marked the event as the real news of the insult was uncovered.

A single raid on any point of the American mainland is all that is needed now. If people can actually see a building tumble down, the flash of a bomb as it hits the corner of a house and the dreary drapery of mangled human figures lying in the gutters; you can start reaching for your draft number. There's something about the smell of cordite and the tang of picric acid that does it. The air raids on London did more to stimulate recruiting than all the gaudy posters slapped on churchyard walls. The dust thrown up by the toppling of a wall may blind many to the actual values in the matter and it will be easy to swing a nation while it is still groggy from the effects of a bombing affray.

But, is it necessary to allow even one bombing raid to take place? Can it be prevented? Will blocked raids bring a comfortable feeling of security and make us contented with our present status?

We believe they can. We believe all attempts to raid any portion of the United States can successfully be halted before the raiders cross our shores. It is a big problem, yes; but it can be done and the sooner plans are made, the better.

How? That's another story and we hope to present it and convince you next month. They may want to drag the United States into a war 3,000 or 6,000 miles away, but can they? END

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Seversky AIRCRAFT CORPORATION
FARMINGDALE LONG ISLAND NEW YORK
Builders of the World's Fastest Airplanes

Stunting

(*Continued from page 44*)

the hospital where we rushed him in a last mad effort.

Since the ship was a new model, that particular crash sent a series of cold shivers down our spines. For, in spite of all that we heard from eye-witnesses, fearful thoughts of possible contributing causes crept into our minds. So we carted every particle of wreckage back to the plant and laboriously pieced them all together—to learn that we could at least sleep with a clear conscience.

This was my first experience in putting back together the bloodstained fragments of a wrecked airplane and it wasn't one that I relished. Little did I realize then how many more of these gruesome jobs my subsequent work for insurance companies was going to bring. There's something about that end of the business that gives one the creeps every time he sees a crack-brained pilot put a ship through a loop or tailspin "for the fun of it."

Off and on, since then, I have had contact with that species of insanity that causes a pilot to pull his ship into loops or tailspins for the mere thrill of it. Generally, they followed Blake although his case stands out in memory just a shade more clearly because it was my first direct contact.

Somewhat more recently there was the case of "Tommy"—a popular young chap who helped push through the air mail for an Eastern operator in the boom days. Tommy was an excellent pilot but he, too, began to show signs of having been bitten by the virus that urges one on to take a chance. In his case the end probably came sooner than usual.

My first and last flight with him was a night hop, from the old Curtiss Field over to Hadley, for the purpose of checking the efficiency of some night flying equipment. First, we started without landing lights—although we had intentionally picked a night without a moon.

Soon we were crossing over midtown New York at a bare 2,500 feet. Another good resolution had gone overboard. Above Times Square I leaned forward and asked: "What are you going to do if the engine pops?" "Land in the river," came the reply. Landing in an icy river in a cabin ship on a dark night seemed a grim prospect for a passenger who, to cap it all, couldn't swim!

Over Newark I stood up to get a better view of the air mail blinkers and was jerked backward into my seat. Tommy had chosen this moment to put the ship into a sudden stall to show his confidence in its behavior. Which left me with plenty of confidence in the ship—but rather less in him. All in all, it was an interesting flight to look back upon. But, arriving home late that night, I remarked that I didn't think I cared to fly much more with Tommy.

Just seven days later, I got a hurried call from one of the insurance companies asking for a report on the cause of a mysterious crash. Tommy had joined Blake, taking his passengers with him. Here was another job of laying out on the floor of a factory twisted pieces of steel tube and broken wires. As close as we could figure it out, he and a passenger were changing places in the air. Stepping into and out of the pilot's seat one or the other stepped on a control wire throwing the ship into a spin at low altitude. There just wasn't time or room to pull her out.

After several of these occasions where you find it necessary to pick quivering pieces of human flesh off the frayed ends of broken wires in a postmortem investigation, any lingering desire to experience the thrills of a loop quietly oozes out of your system—"spurlos versunkt," as we used to say.

And, to make the possibility of enjoying your next meal just a little more remote, there often comes the vivid recollection of one eaten recently with the man whose brains are now part of the congealed dirty red mass that you're trying to wipe off this folded steel tube so you can see if the weld gave before or after it smashed its way into his skull.

It's not a nice job at the best even though the knowledge gained may be constructive. And it certainly is not improved by the realization that you lost a good friend when this mess that is now a tangle of wire and steel tube drove its way down into the soil of Long Island, or New Jersey, or Pennsylvania.

That's why I don't like stunt flying.

END

Congratulations!

For 1937 the coveted awards of the National Safety Council go to American, Eastern, Northwest and Pennsylvania-Central. In compiling a total of 547,000,000 passenger-miles without a passenger fatality, these air lines have made an outstanding contribution toward building public confidence in aviation.

SPERRY

SPERRY GYROSCOPE CO., INC.

BROOKLYN, N. Y.

Lightplanes

(*Continued from page 58*)

As can be understood, this type of fuselage is practically finished when assembled. The streamlining is automatically done. The fabric may be stretched directly over the meshwork, but Yates prefers to run light spruce strips lengthwise over the mesh. The photographs show construction for an enclosed type of low wing cabin ship and the bulkheads are shaped accordingly. For an open cockpit job the whole fuselage may be made up without any break in the outline, and then the cockpit opening cut out where wanted. The cutout is then framed with light plywood. Where concentrated loads come the bulkheads are usually reinforced with steel plates.

A couple of years ago the English were much excited about a new type of airplane construction (geodetic) that was hailed as the final answer to every problem. This turned out to be precisely what we have been talking about. The discovery was a little late as this writer saw a complete scale model of the Yates scheme in 1927, and the model was several years old at that time. Although not perfected the basic idea was there.

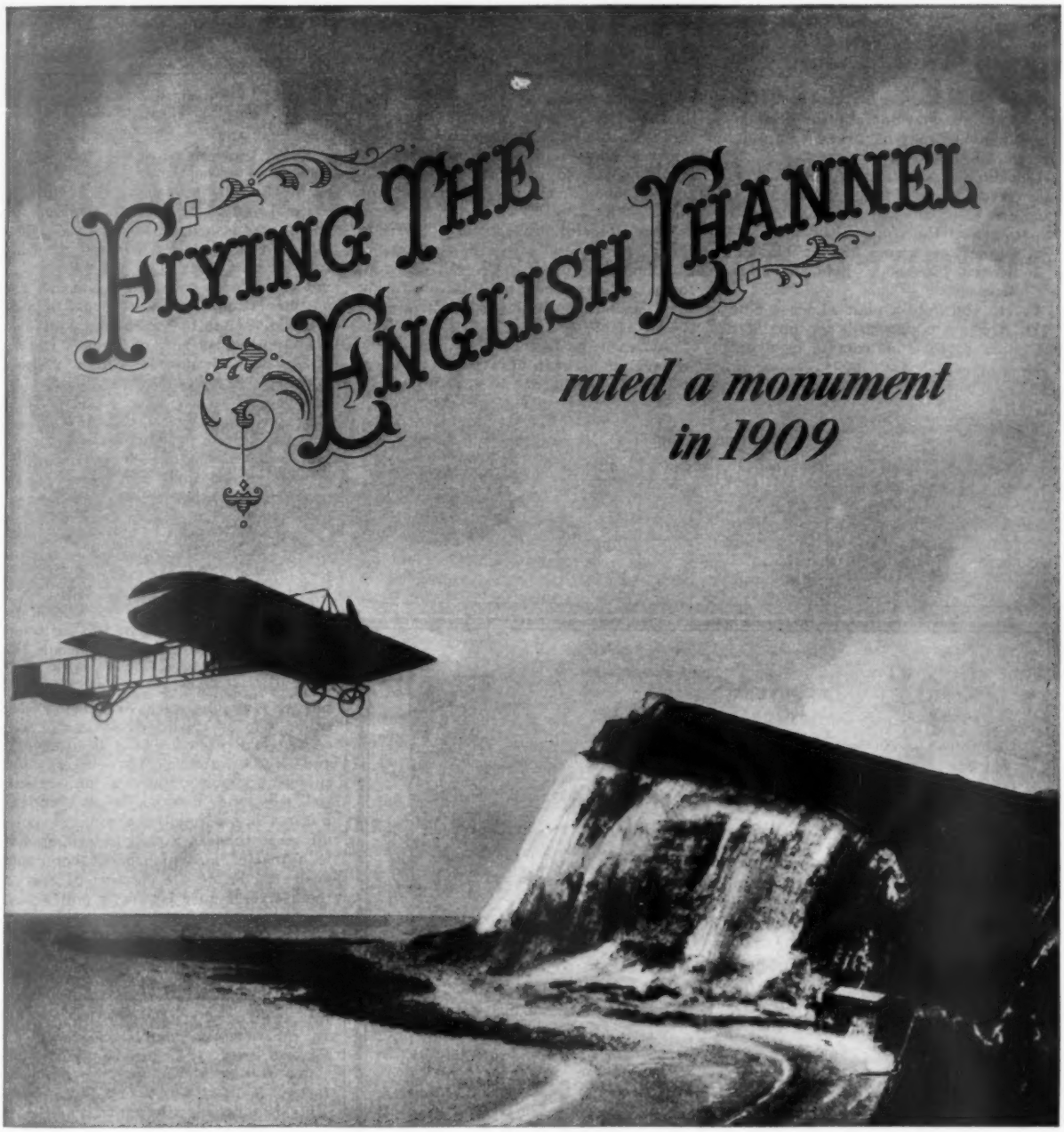
While for business reasons we cannot give details here, it may be said that Yates has developed a wing around his diamond mesh scheme that is certainly the acme of strength and lightness. In the true sense of the word the wing has no spars, although there are lateral members that act as formers. To give some idea of its efficiency a panel having a length of 15 feet was supported in the middle. Four heavy men rested their entire weight on one corner and caused a deflection of less than one-eighth inch. In spite of the extreme strength and rigidity this panel weighed but 24 pounds!

Amateur airplane building in America has been hampered by just two things. One was unjust and restrictive laws, and the other was the high cost of materials and skilled labor formerly required. If a more liberal and far-sighted government should come into power that would remove the first hindrance. George Yates has already removed the other. A few dollars' worth of spruce, a couple of pounds of nails and a can of glue are all that are needed to build the complete basic structure of an airplane. The Yates ship is marvelously light and strong. It is adaptable to any shape or design and its cost almost sounds too good to be true.

At this writing Mr. Yates has four ships going through his shop at one time. They are all low-wing cantilever jobs, and all to be powered with Continental A-40 motors. Three of them are single motored, while the fourth will have the two A-40's streamlined into the leading edge of the wing.

And, gentlemen, you should see them!

END



All England was stirred, 29 years ago, when M. Bleriot flew the 25 miles from Calais to Dover Downs. Later a monument was erected on the spot where he landed. Now *daily* channel flights are news only in airline time-tables.

Even the most spectacular transatlantic and transpacific hops are front-page news only for a day. Refinements in fuels and engines have made yesterday's records today's routine operation.

But what about the next 29 years? Where will still further improvements come from? The answer is the same as in Bleriot's day—from improvements in fuel and engine.

Ethyl engineers are cooperating continuously with aviation engineers in the never-ending task of developing better gasolines and engines. Only through constant research can the transports of 1967 make those of today seem as old-fashioned as Bleriot's monoplane now does to us. Ethyl Gasoline Corporation, Chrysler Building, New York, N. Y.

Flying Insurance: Can You Get It?

(*Continued from page* 51)

ture as a fare paying passenger?" Answer "yes" to that one and the premium on your policy may be jacked up a notch or two.

Question number four is broken down into several parts and is designed to give the company an idea as to your experience at the controls.

A. Have you ever piloted a plane?
B. Have you ever held a pilot's license?
C. Do you hold a pilot's license now?
D. Are you taking or is it your intention to take instruction in flying?

You may also be asked to give any Military or Naval Flying experience you may have had.

Having got that off your chest all you can do is "wait and see" until your application for insurance is either accepted or turned down.

On the other hand, some life insurance companies attach to their policies what they call an Aviation Rider which limits the company's risk to the reserve on the policy in the event that the policy becomes a claim as the result of an "Aviation Activity." Unfortunately, reserves on life insurance policies accumulate very slowly so, unless your present policy is an old one or, if it contains such a rider, for the sake of your widow don't go up.

Two general forms of "Aviation Rider" are in use. One the *total* exclusion form, the other the *partial* exclusion form. The former or total exclusion form generally reads something like this:

> "Death as a result of service, travel or flight in any species of aircraft is a risk not assumed under this policy; but, if the insured shall die as a result, directly or indirectly, of such service, travel or flight, the company will pay the beneficiary the reserve on this policy."

The second, or partial exclusion form, is the same as the above with the exception there is added the clause "except as a fare paying passenger." A few companies further limit their risk under this form by adding, "Over established airlines with a licensed pilot and a licensed plane."

This type of rider, used by some companies, is further modified so that the exclusion will automatically expire at the end of two years from the time the policy was issued, in which case and at that time the policy becomes "incontestable for any cause."

The majority of state insurance departments approve these forms of aviation riders but the following states do not approve either of them, Illinois, Michigan, Minnesota, North Dakota, South Dakota, Oklahoma and Texas. If you happen to live in any one of those states be sure to get the state insurance rulings in your particular case.

If you happen to be a pilot, co-pilot, stewardess or other employee of a licensed aviation company and are actively engaged in flying, do not despair of getting insurance. Many companies will insure you but of course at rates which have been materially boosted over those granted to occasional flyers.

The subject of flying is still a debatable one in the minds of most life insurance executives, hence, as a general rule, the majority of companies issue their policies only after giving personal consideration to each individual case. Taking an occasional trip as a paid passenger in a licensed plane, piloted by a licensed pilot and licensed to carry passengers, as a rule is not considered an "unnecessary risk" by the average large company, but making a habit of flying or going up other than as a paid passenger, etc., is a matter in which most companies desire to decide the element of risk for themselves before issuing a policy.

END

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Quandary at Altitude

(*Continued from page* 49)

the airplane fly itself off the ground. In other words, make a conventional take-off, with the ship in flying position. But whatever you do, don't try to haul it off or take off on three points. This has caused more grief and damage to ships and pilots than any other high-altitude thing—unless it is the stuffed clouds we have there.

Stuffed clouds, according to a story that is racing through the West Coast airline hangars, are "clouds with a mountain in them."

I have a sneaking hunch that some of these pilots who fly out through the west are prone to pooh-pooh "stuffed clouds". At least you'd think so, judging from some of the accidents that have happened both to airliners and private ships flying over western states. But no high-altitude cautioning would be complete without great emphasis on our high-grade stuffed clouds. They're not stuffed with meringue. The filling is first class Rocky Mountain stone—and it's tough.

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To the Rescue

(*Continued from page 46*)

man at the door of the cabin. He tried to shout, but words would not come to his lips. Almost paralyzed he saw the Indian fight the slipstream for a moment, then push the door open with his shoulder. With a wild cry on his lips, the Indian plunged through the open door to the muskeg 3,000 feet below. His body was never found.

Up on McConnel Creek in British Columbia, 40 men were locked in their camp by ice and unprecedented falls of snow. The provisions had run out. The men were starving. It was impossible to get in to McConnel Creek by do team or pack animals. If food was to be sent to the men an airplane was the only logical means to be used. But an airplane couldn't land there.

Billy Wells, Canadian Airways pilot, now a Trans-Canada Air Mail pilot, left with his air engineer for McConnel Creek. In the cabin of his Fokker Super-Universal were bags of food. The Fokker was equipped with floats.

High above the mining camp on McConnel Creek, Billy looked down on the river and decided it was impossible to attempt a landing. He signalled his engineer, Bill Faulkner. Faulkner went back into the cabin and removed a door. He then took a piece of rope and lashed his foot to a stanchion. This done he signalled Wells that he was ready.

Faulkner had to lay flat on his belly on the floor of that madly pitching plane that was being thrown about by wicked air currents that surged up from the canyons on all sides. He had to lean far out and cast his bags of food in a twisting motion to miss the floats of the plane. Nevertheless he landed every bag in a small circle each time Wells made the round.

At the present moment, Sir Hubert Wilkins, accompanied by Herbert Hollick-Kenyon, famous Antarctic pilot is in the north country preparing to renew the search for the six Russian flyers lost on a flight from Moscow to New York.

This flight will be no novelty to Hollick-Kenyon who has spent most of his time flying the north country on "mercy flights" or in searching for lost parties. He was a leading figure in one of the greatest aerial searches in history when he spent almost three months seeking the lost McAlpine party in the wilds of the Arctic back in 1929.

But from Labrador to Alaska, airplanes are continually engaged in "mercy flights." On a tiny island out in the Atlantic, one of the Magdalen group, a girl is fighting for her life. Ninety miles of open water lay between her and the hospital at Charlottetown. But if the girl is to live she must be gotten to hospital at once.

Pilot Saunders, flying the mail for Canadian Airways, landed with mail. The doctor informed him of the girl's condition. Saunders fixed up his cabin to accommodate a stretcher. In a few minutes the plane was on its errand of mercy and two hours later the girl was on an operating table at the Charlottetown hospital.

At Outarde Falls on the St. Lawrence River, a worker was suddenly stricken with appendicitis. No medical help was available, but three hours later found the man on the operating table at the Quebec General hospital 200 miles away. He had been flown there by a Canadian Airways plane.

A mine manager was attacked by a savage grizzly and badly battered. He was at Burns Lake, 800 miles from Vancouver over the towering Canadian Rockies. Gangrene was beginning to set in his wounds and the man was certain to die unless he could be gotten to a hospital. A radio call brought a plane from Stewart, B. C. The plane flown by Walter E. Gilbert, carried the mine manager in to Vancouver and ultimate recovery.

Northern pilots are angels in disguise. Ask any dweller of the wilderness and he'll tell you. They're all swell fellows. Ready at any time to deviate from their fixed course to rush an unfortunate to medical help. They'll drop anything to save a fellow man, and they'll take long chances just to get help to those who need it. No better compliment can be paid to a pilot than to call him a "mercy flyer".

END

Model

(*Continued from page 68*)

as shown on plan. After this has been done, cover the complete strut with bamboo paper. This will add to the strength of the strut. This model may be flown with or without the wheel pants. Model is equipped with 2¼ inch streamlined, puncture proof aero wheels.

Construction of Elevator and Rudder

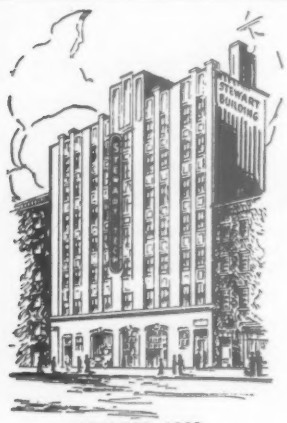
The construction of the elevator and rudder is very simple as both are built of a flat section, 1/8 inch in thickness. Construct upon a flat surface so that they will not have a tendency to warp. Neither elevator or rudder are adjustable, they are both held securely in place with a small brace wire which passes through elevator and rudder. Wire is so arranged that it may be adjusted for tautness (see detail on plan). Do not omit the small aluminum pieces which are cemented on the elevator and rudder for wire to pass through. This prevents wire from cutting into the balsa.

Construction of Wing Panels

All ribs are cut from 1/16 inch sheet balsa. Next place spars, leading and trailing edges in position to receive ribs. Do not omit any of the bracing between the ribs as this is necessary to strengthen the wing. After the two wing panels have been constructed, they are cemented togethed as shown in front view of wing. The front and rear reinforcement spars are next cemented in position. Cut with a sharp razor through the two center ribs so that the basswood pivet block can be cemented in place. Next attach the center wing panel support at the bottom center section of wing. See perspective of wing section.

The entire model is covered with a good grade of bamboo paper. In applying the paper to the framework, ordinary model airplane dope will not do, ordinary cement, thinned out slightly makes an excellent paper cement. In order to obtain a nice covering job, see that all wrinkles are removed. Do not stretch the paper so tightly over the frame that it will have a tendency to pull out of shape

END



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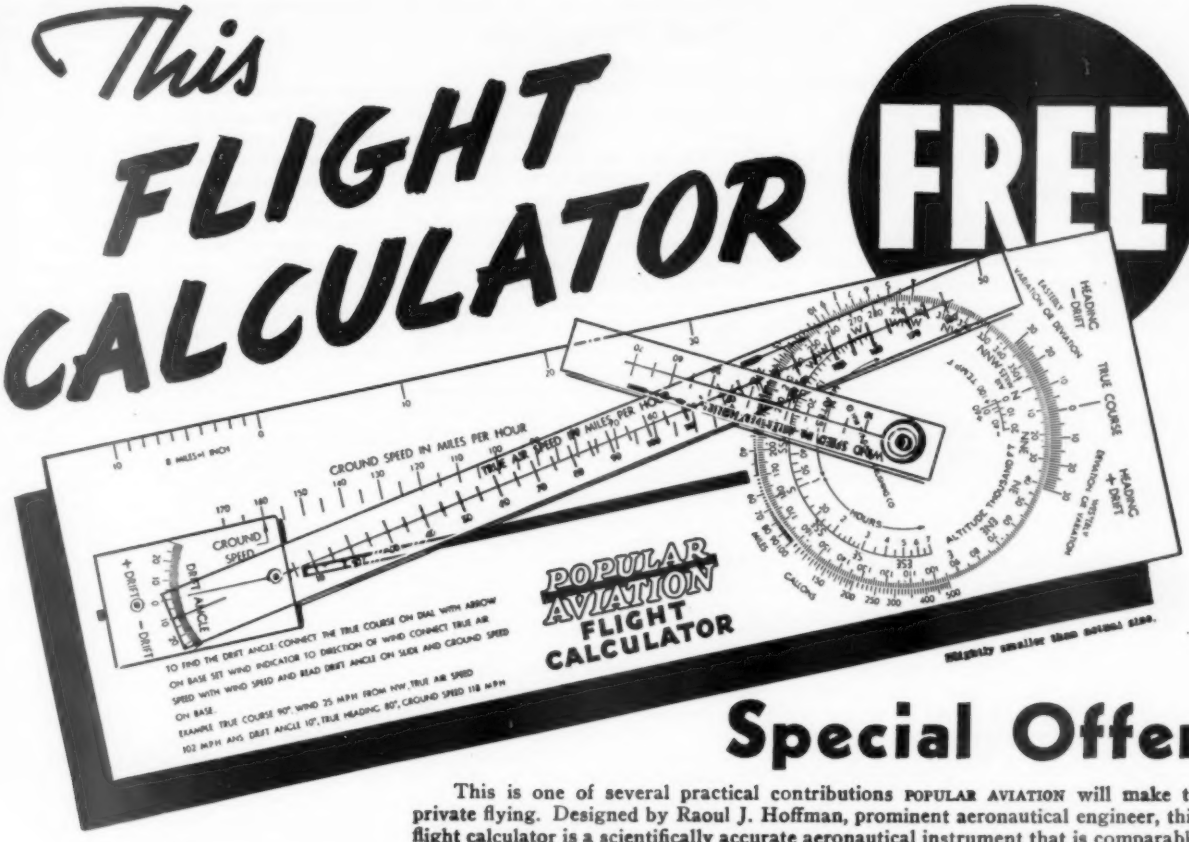

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Those Flying Turks

(*Continued from page* 20)

cestors never dreamed of doing. He had a fine time of it for 15 minutes, looping the loop, barrel rolling, and "power" diving if such they can be called with a glider—then come down finally with a series of roller-coaster humps to break his velocity.

That over, we drove five miles farther to the airdrome where the League kept some of its motor planes. Derimtekin explained that his outfit has 12 such training ships and had just bought ten more ships from Germany.

In the hangar stood two bi-motor Fokkers—cabin planes which could be converted, merely by sliding out two removable seats, as ambulance planes. Their speed, he revealed, was 200 kilometers an hour, but he was getting some Magna-5 motors which would boost the speed to 245 kilometers. We also noted there a General Aircraft *Monospar*.

On the field, all of the planes were trim little two-seaters. I went up for a ride in one of them and was impressed by the easy way this two-seater responded when the pilot tapped my shoulder, grinned and then began producing a bit of funny stuff.

"Mayonnaise!" he shouted in my ear as we rolled. "I'm making salad."

We were questioned eagerly by three uniformed young women who deserted their planes to ask whether women did much flying in America. I had to admit we had nothing in the way of universal instruction, compared to what I was seeing in Ankara.

"It's all free," they said through an interpreter. "And we love it. Our country gives us everything." While that is true, it must be pointed out on the other hand that the Turkish taxpayer pays—and heavily.

Our next stop was back in Ankara, at the stadium grounds. There stood a parachute tower, and that gave me a sizeable thill. I have had some pretty interesting flying—always as a passanger—but never anything in the way of parachute jumping.

Now this was not the real thing. It was a tall tower, made of concrete, containing an inner winding stairway which led up to a height of 160 feet. The city of Ankara had donated the plot of land and the Turkish Bird had build the tower in a style to fit the surroundings, as a cost of $50,000.

Atop was a platform from which the youth of the country learned the art of 'chute jumping, by the captive parachute method. The principle is simple. Several countries, including the United States, are doing the same thing now. Turkey has two such towers, the one at Ankara and another at Izmir (Smyrna). The parachute is held suspended from a steel yardarm, which is attached to a counterweight. The jumper stands upon the tower's roof, dons a regulation 'chute harness, then the straps from the billowing 'chute are fastened to the harness and the next thing to do is jump.

I recall wondering, as I stepped through the little window and into the gaping air, whether the straps might not get tangled. But no such bad luck. Gripping the straps firmly, I dove through the air for about 25 feet before straps became taut—and then drifted down at about 20 feet a second, a good enough pace to hit ground with a sizeable wallop.

I wondered whether this jump compared in difficulty with the ordinary kind. The army officer in charge explained through an interpreter that a regulation 'chute jump would now be simple for me.

In fact, he asserted, this jump from a tower was even more nerve-wracking than the usual type from a plane. It is a matter of psychology, he said. As one steps off the tower, he gets a terrific feeling of distance to the ground below. And that breeds terror. But in jumping from a plane, the officer explained, the earth is so far away it hardly matters and the distance factor is not so disturbing. One merely has a sensation of going into the air. Maybe—I don't know.

Here again, it is a matter of both sexes on equal terms. After four jumps, those Turkish Bird members who want to keep on learning 'chute jumping, may continue. Others are invited to drop out. Some Turkish girls have made as many as 50 dives from airplanes after their initial training with the tower.

I was told of an incident which occurred on October 29, 1937, Turkey's annual Independence Day. There was a mass parachute jump by 50 Turkish Bird members, including eight girls, before the eyes of Ataturk in the Ankara stadium.

They jumped from a height of 1,000 metres. One girls seemed to be in difficulty. Before the anxious eyes of fifty thousand gazers, she dove through space—and her 'chute would not open. One thousand feet, 800 feet, 600 feet—still she plunged. Then, at a bit more than 400 feet, the silk billowed into the welcome mushroom. An ambulance had raced to the spot where the girl was expected to crash. The internes found her placidly combing her hair. She explained she was tired of ordinary safe jumps—she wanted to try her hand before the eyes of her idol, Ataturk, at a delayed jump.

Meanwhile, Turkey is not neglecting her commercial air service. Back in 1933, she set up an airline under the War Department. It has been since turned over to the Ministry of Public Works and is called the State Air Line. It is government-owned, as are practically all railway, steamboat, telegraph and telephone facilities in this totalitarian nation, which at the same time, resembles a democracy in more fundamental ways than it does a Fascism.

Before the service was opened, a number of pilots and ground mechanics were sent to London to study the latest developments in commercial air service. Today, there are regular daily trips between Istanbul, the nation's biggest city, and Ankara. Other airways and airports are being planned.

The Istanbul-Ankara line has opened the eyes of the Turks to the possibility of speedy travel, much faster than trains can go through the hilly country. The express trains take 14 hours for the Istanbul-Ankara run; the planes make it in one hour and 50 minutes.

At its inception, this service had two German Fokkers and an American Curtiss. Since then, they have tried De Havillands, and only recently bought three *Dragon Rapides*, each capable of transporting seven passengers at 250 kilometres an hour—about 160 m.p.h.

The jockeying by foreign airplane manu-

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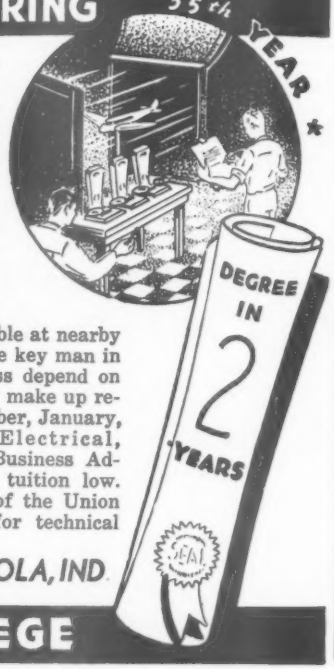
55th YEAR



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TRI-STATE COLLEGE

facturers to supply Turkey—and especially the Turkish Army air force—with its equipment is an intriguing one. And it is a fine compliment to American planes that they are so well thought-of by the Turks.

The competition is all mixed up with international trade complications. Turkey is an example of a nation that is involved with quota and barter agreements. She does most of her trade—about 40 percent of the total—with one country, Germany. There is no money involved. It is all swap—Turkey sends her produce to Germany and Germany gets rid of her manufactured goods in Turkey. At present, Germany is far behind in evening up the balance and is all too willing to give Turkey warplanes.

But the Turks want the best planes in the market—and that means American ships to them. That is why they collect every bit of foreign exchange they can get and use it with which to buy American planes—Martin bombers, Curtiss *Hawk* pursuit ships and the like.

Last year, Turkey plumped down $2,500,000 in cash and in return got 20 Martin bombers. They were shipped across from Baltimore and assembled at Instanbul with the aid of four American aeronautical engineers and test pilots. The first four bombers of the batch were assembled in time to take part in the October 29 festivities. And the Turks were enthralled by the maneuvers performed by these gigantic 220 m.p.h. battlewagons of the air—model B-10B, powered with 1,000 h.p. Wright engines and carrying one-ton bomb loads.

Through a licensing agreement, the Turks are themselves building Curtiss *Hawks* at their infant industrial city in the nation's interior, Kayseri. These they equip with Wright air-cooled motors—the Turks, like the rest of the world, have high respect for the American engine.

The result of it all is that the Turkish air force now has a snappy, modern flotilla of no fewer than 300 first-line planes, including a hard-hitting nucleus of American bombers. Turkey has an air force comprising 3,410 men of all ranks. And her regular budget appropriations for the air force runs about $4,000,000 a year.

But that is only a part of the picture. In June, 1935, when Prime Minister Inonu sent out a call for contributions with which to put the air force on its feet, he got $24,000,000 for the special fund.

The aviatrix who boasted to us, "Our country gives us everything," told but one side of the story. The other side is taxes. Last year, the government managed to collect an additional $8,000,000 for aviation. This went to the Aeronautical League.

One of the devices used is the aviation tax. The Turk is paying plenty of income taxes as the price for modernization and preparedness. The man of ordinary means pays about 25 percent of his salary in income taxes—and of that 25 percent, two percent is earmarked "for aviation."

Then there is the regular amusetment tax. For example, when I went to a cinema in Ankara, my 50-cent ticked showed that the theatre got 38 cents, the municipal tax was five cents, the "crisis" tax—used to make up deficits in the national budget—was two cents, and the airplane tax was five cents.

Nor is that all. Most things in Turkey are run by government monopoly or industry. One of them is the lottery monopoly. Only the Aeronautical League has a right to run lotteries. And like China—who was the first nation to get the idea of running national lotteries as a way of converting its citizens' gambling streak into warplanes—the Aeronautical League makes a pretty penny out of the lotteries, of which there are three big ones each year. Last year, the league netted $1,500,000 after all lucky winners and expenses were paid.

Most of the money she has been getting from shipping tobacco to the United States has been exchanged for American machinery. The bulk of this, as I have shown, consists of airplanes. But a considerable portion goes for oil-well drilling machinery. Turkey is in a strange position. She is next door to Russia, Rumania and Iraq, all of them tremendous producers of petroleum. And yet somehow, the Turkish air force must rely on imported oil and gasoline.

But the Turks don't believe that Nature has singled them out for ill treatment. They are certain that they lie on the same oil strata which runs under Iraq. And they feel it is only a matter of time and digging before they find oil themselves.

In other words, the Turk is out to build up his nation for peace and for war, if it must come. The way he is concentrating on aviation is an indication that the Turk will not be caught again the way he was back in 1912, during the Balkan War that led into the World War. In those days there were international soldiers-of-fortune like Bert Hall of Lafayette Escadrille fame, who flew for the Turks at $100 a day, cash on the line. But when the money was slow in coming, Bert and his pals merely flew over to the Bulgarian side of the fray and fought against the Turks. Their allegiance was worth $100 a day.

The Turks don't expect to rely on these adventurers in the future. They have the patriotism, and they hope to have the planes, with which to care for themselves.

END

A

P-A SCOOP!

Lieut.-Col. Robert Olds, the Army Air Corps flight commander who led six **Flying Fortresses** on a good-will flight from the United States to South America and return, has written the story of that famous flight exclusively for POPULAR AVIATION. Read his colorful story of that record-breaking flight in the

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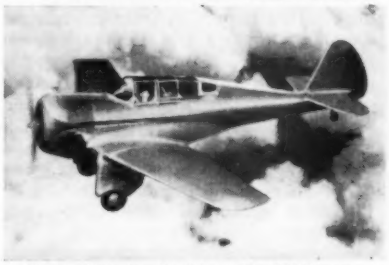

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The Man Under the Hood

(*Continued from page* 48)

POPULAR AVIATION never misses an opportunity to get its readers the latest and best. . . This is just my way of backing into the announcement that **Frank G. Tinker** Jr., author of the series in the *Saturday Evening Post* on his own, and the experiences of other American flyers in the **Spanish** war, now is doing a piece for this magazine. . . it will be in the next issue—we hope. . . **Tinker** will write somewhat on the technical side, for all of us who are curious to know something more than he already has written about the American engines, Russian airplanes and Czechoslovakian machine guns he used. . . we hope, too, that he'll tell us about the performances of the German and Italian planes against which he fought. . . your instrument pilot wants to know about those highly-touted **Messerschmitt** monoplanes. . . one of which holds the world's landplane speed record of 379 m.p.h., you know.

* * *

We have two little items here you might like. . . **Tinker** is writing for us at DeWitt, Arkansas. . . quite appropriately, it seems, he lives at 214 Shotgun terrace. . . that boy even picks violent streets to live on. . . **Albert J. Baumler** of Trenton, N. J., the only other American who flew the fast little Russian monoplanes with **Tinker**, is also back in the U. S., as you probably all know. . . did you know that he's using the money he made with the **Loyalist** air force in **Spain** to finance his way through an aeronautical engineering course at New York University?

* * *

Attention, all you readers who've been wanting to fly but haven't had the money to pay $8 to $12 an hour for dual and as much for solo time. . . next month, this department predicts, a national flying club organization—not for profit—is to be founded in this country. . . this organization will do for the U. S. what the state-subsidized flying clubs do for Germany, Russia, England, France and Italy. . . and through an arrangement for centralized buying of airplanes, fuel, supplies, etc., it will do it at a price which will bring flying time within reach of anyone who has a job, however small. . . I've been told that time will be sold on new lightplanes with 50 h.p. engines—planes like **Taylorcraft** or **Aeronca** or **Cub** which should now have a top of 100 with the added horses—at between $2 and $4 an hour. . . and all flying will be strictly supervised to prevent accidents and to insure uniform instruction. . . interested? . . .

* * *

Chances are pretty good that, by the time you read this, **Capt. Alexander Papana**, the Roumanian ace, will at least have started a flight from **New York** to his native land . . . as this is written, he had applied for permission to make the trans-Atlantic flight . . . the ship we understand, is a twin-engined **Barkley-Grow** . . . he originally intended flying a special tri-motored **Bellanca** . . . which **Frank Hawks** now is said to be grooming for some summer record-flying . . . **Papana** may have a bit of trouble with the **Bureau of Air Commerce**, though . . . the government boys have a dislike for needless life-risking . . . you'll remember when the **Bureau** dropped the axe on that **New York-Paris** race last year . . . there are a few lads still planning hazardous flights . . . **Jimmy Mattern** wants to go over the **North Pole** . . .

* * *

Just in case any of you fellows in the industry don't yet know about it, **"Shorty" Schroeder** was in pretty serious condition . . . strain and overwork hasn't done that generous heart of his any good . . . it's the result of his famed altitude flight . . . his efforts on aviation's behalf back in those pioneering days . . . so you buddies of his drop him a line . . . it'll make him feel so much better . . . he's back at work . . . but taking it very easy . . . doctor's orders . . .

END

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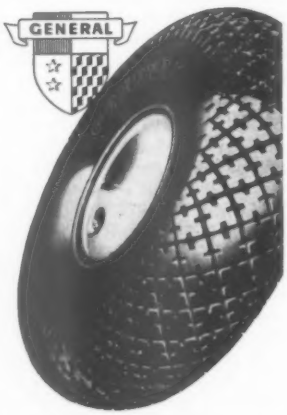

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Flying Tree

(*Continued from page 46*)

At about this time the local school was dismissed for a half hour so the pupils could see the plane. Those were the days!

At approximately 2:30 the group returned, as the story goes, followed by a large truck carrying two maple trees, one about 11 feet high and the other about 15 feet high. These trees were put out on the dock, by the plane. By this time there were several state police officers at the scene. The men put the large tree in one side of the cockpit and the pilot squeezed into the other side. Then, as usual, a charming young lady stepped in and she also, after much difficulty, squeezed in the cockpit. A large cloth sign was hung between the struts of the plane, which read something like this:

THE FIRST TREE EVER CARRIED BY AIR
Lake Mahopac to New York City
Amawalk Nurseries, N. Y.

Then, with all this advertising, many photos were taken. The young lady smiled cheerfully (it must have been difficult, considering the way she was squeezed in the cockpit) as a cameraman took motion pictures. After the photos were all taken, the sign was taken off the plane and the woman stepped out. The men took the large tree out of the cockpit and put the smaller one in its place.

It was now 4:30 and the water was rather rough, for the wind was snapping the surface of the lake into whitecaps. The pilot remarked that the rough water and increased wind would aid his take-off. After warming up his engine, the pilot headed the plane into the wind and opened the throttle. He finally coaxed the ship to leave the water and it gained altitude sluggishly as the pilot circled the lake, the tree bent over the top wing by the force of the wind. It came very close to the propeller blades mounted on the pusher motor, but always missed them. With a final wave of his hand to the group below, the pilot headed his plane for New York City, 60 miles south.

We don't know how long it took him to get to New York, but he landed in the Hudson River alongside Riverside Park. The tree was taken to the park and planted by René Fonck, the French ace of aces, in memory of the American flyers who died in the World War. It was a fitting memorial to those brave men; the first flying tree, in their memory.

As far as we have been able to ascertain, this was the first time that a tree of this size was ever flown by air.

END

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Sky Ranching

(*Continued from page 17*)

powered rifles of the pioneers—had it not been for their desire to investigate.

Using a blanket, a sack or even the gray smoke of a small camp-fire whipped into irregular and uncertain gyrations with a hat of cloth, the hunters were able to turn fear into curiosity and draw the antelope within firing range.

The sprint crown of the animal world is claimed by the cheetah, the Asiatic wild cat that is capable of obtaining a speed of 70 m.p.h. for a distance up to 100 yards, but the real runner is the American pronghorn, who lives on the prairies and open country, and depends on his legs as his only means of escaping danger.

On several occasions Charley Belden, the man in the ten gallon hat who is noted for his photography and his uncrowned title as Antelope King, has clocked the trim little animals at 60 m.p.h. with a plane for more than two miles at a stretch, and once followed a bunch for 45 minutes at an average speed of 35 m.p.h.

Years ago, when the first of the buck-skin-clad trappers and sun-tanned pioneer emigrants pushed across the Mississippi and ventured into the great plains of the west, they approximated that 40,000,000 antelope roamed across the grassland, mingling with the buffalo, and adding their splash of color to the scenery as they became frightened and dashed off, their white rump-patches flashing danger signals.

But the history of the antelope parallels that of the buffalo, except that a rigid protection by law kept them from almost complete extermination, and today more than an eighth of the 40,000 creatures left in existence, roam the leased and deeded land of Charley Belden's Pitchfork ranch. Another 12,000 inhabitate other portions of Wyoming.

As the bands are quite centralized in certain areas of Wyoming, the destruction to range and hay fields has been intense, amounting to thousands of dollars in claims placed before the Game and Fish Commission. In view of this situation, and the fact that, in the eyes of the law, antelope can do no damage and therefore, no claims can be paid, the Commission opened a brief hunting season, and each year about 2,000 licenses are issued to the state and non-resident hunters.

Belden is a graduate of Boston Tech and thoroughly in tune with the conservation movement throughout the United States. Yet, being financially injured each year by loss of hay and pasture lands, he felt a better method of controlling the animals would be to capture them in areas where they were abundant and transport them to other localities where there were no antelope.

With this in mind, Belden secured permission from the State Game Commission to build a pen, capture some of the animals and experiment. A few mature animals were driven in, roped and taken to a vacant stall in the horses' barn where they were again released.

The trial was a horrible failure, and in Belden's words, "as far as I know none of the animals were physically injured in taking them, but the fact remains that the next morning all but one of them were dead. I believe they died of fright. The one remaining antelope lingered for a week or ten days, then it died."

Thus concluded the first chapter in the restocking of denuded ranges. Other mature big game such as elk, deer and mountainsheep has successfully been moved for restocking purposes. Notable among these was a band of elk caught in Yellowstone Park in 1909 and taken to Australia, where today they have multiplied to such a number that open season has been declared.

Next Belden experimented with the young. The babies, from a few hours to a day or two old, do not try to run, but drop beneath the shade of a sage-brush or rock and depend on their protective coloring to aid them in escaping detection. During this short period, between their birth and the time they can outrun a good saddle horse, they are caught quite easily.

At the home ranch Belden carried on his experiment, feeding the little fellows from nipples on pop bottles, taking all the precautions demanded by a maternal heart. The

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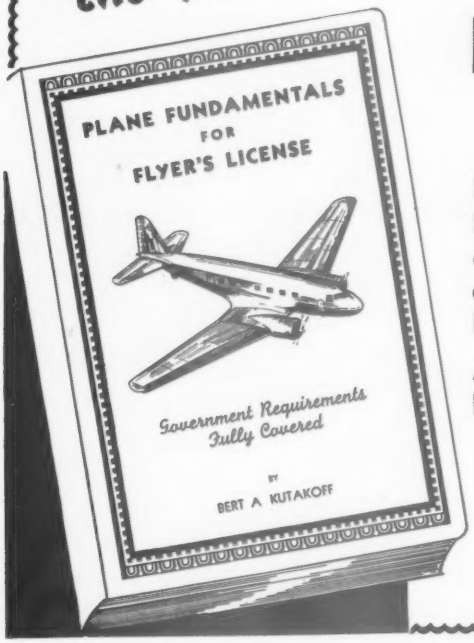

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bottles were sterilized before each feeding, the warm milk of the same cow going to the same baby three times a day. At two months the young pronghorns weighed between 30 and 40 pounds, could be handled easily and responded readily to human affection.

Once again Belden undertook transportation. Zoos in the East were crying for pairs to fill empty pens, sportsmen's clubs from all over the country were asking for small herds—and the hay fields of the Pitchfork still were being ravaged by 5,000 grazing animals.

The youngsters, properly crated, were sent by train and truck, but again their sensitive natures took toll, and they died before the trip was completed—and Belden was virtually back where he started from. Plenty of antelope, but no way to move them.

The problem was a perplexing one. Late one afternoon, as Belden trotted his cow pony in off the open range he watched a few of his star boarders graze across the grassland. Their feed bill came high, particularly during the lean years of the drouth, but apparently there was no solution except the hunting.

As the rancher dismissed the matter from his mind and turned to more pleasant thoughts, a silver gray monoplane dropped out of the sky and settled down on the wings of the setting sun, coming to rest a dozen rods away.

It clicked! It would work! Spurring his horse over the open ground he shouted, ignoring the genial smile of his pilot friend: "How about making that ship into a flying box-car?"

"I don't care what I make out of it as long as it flies," Bill Monday answered. Thus birth was given to a new industry as the two men chatted that July evening.

Test flights and trial runs were made. The little fellows did not mind the big-bellied eagle that carried them in its stomach, then put them out miles from where they started. Airsickness did not bother them. They lay on the hay beds in the back of the ship and peacefully rested while the 530 h.p. engine pulled them through the skies. Altitude changes had no effect, and when the temperature climbed the plane soared to a higher elevation where it was cool and more to their liking. The set-up was ideal. Belden announced that he would guarantee live delivery and orders poured in from every big zoo in the United States.

Each summer now the Ryan wings its way eastward, or westward or south to gulf, depositing baby antelope in zoos, parks and private hunting reserves. Each time the big ship settles to the ground and the door swings open a man in a ten gallon hat and a man in a five gallon hat grin congenially out at the reporters, photographers and interested spectators, happy in the fullness of the life they lead.

Today Charley Belden tours the United States—when he's not running his popular Wyoming ranch—lecturing and showing motion pictures in connection with his unusual business. Meanwhile, the Pitchfork Ranch is known throughout the country by many airmen as a heaven-on-earth where they can fly for a short vacation. The ranch airport always is busy.

END

The Handy Line

(*Continued from page* 40)

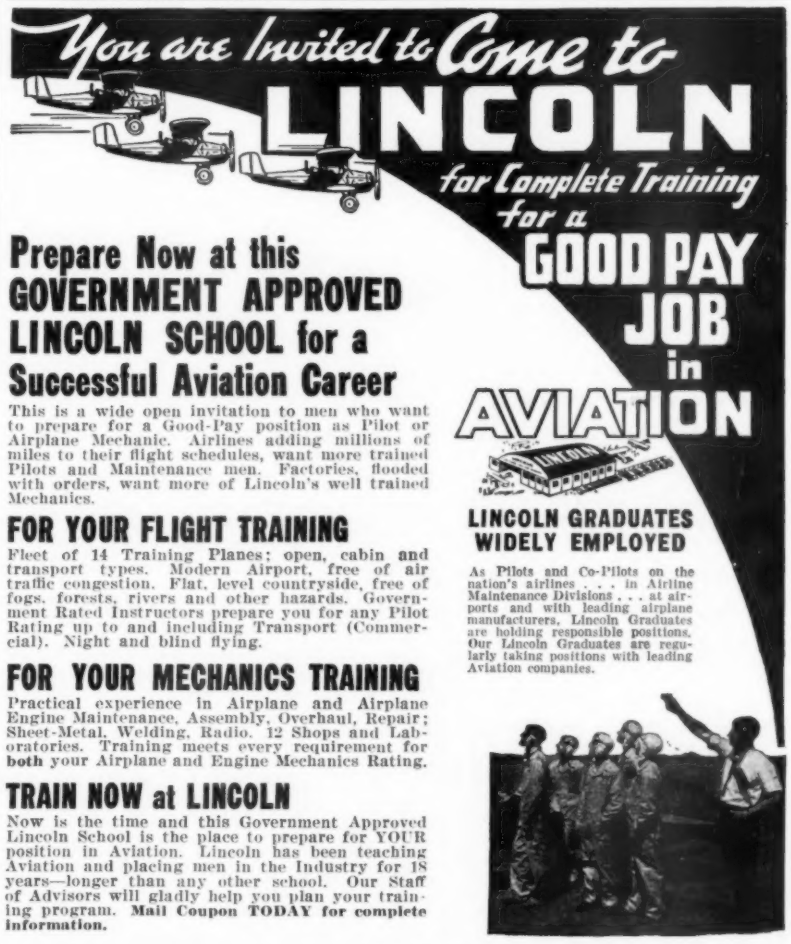
tempted to keep up a sort of a contact with the mainland during the winter months, to get in fresh foods, mail and newspapers, doctors and undertakers when needed—but frequently these contacts were broken for days at a time.

The jobs of these island mail men became recognized as the most dangerous occupations, and many were lost. For Lake Erie is cruel and her storms, due to her shallow waters, compare with any in the world.

When ice was frozen thick and solid between the islands and the mainland, the job was comparatively simple. The mail contractors who also carried an occasional passenger at $15 each, bought up junk automobiles at $10 or $15 each, then fastened long planks across the tops. If the car broke through the ice, the planks kept it up long enough for the occupants to get out.

When the ice was broken, the island mail men used small open boats equipped with runners. When the ice was solid, they pushed the boat across the ice, the passengers giving a hand; and when they reached open water, they climbed into the boat and rowed across. This usually required a full day—a hard, uncomfortable day—for the one-way trip.

No wonder the islanders preferred to stay at home; no wonder many mail men were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lost; no wonder commodities transported that way cost a young fortune.

Then came Milton Hersberger, a young airplane pilot, who saw the discomforts of this kind of transportation—and saw an opportunity. "Airplanes can do that job a lot faster, safer, and cheaper," he said, "and make a lot of money for the operator."

Hersberger, with R. N. Anderson, another flyer, started the Erie Isles Airways in 1930, using a couple small open cockpit planes. And the line was an instantaneous success, for they cut the time from the islands from one day to five to 10 minutes; they cut the prices from $15 to $2; they slashed the freight prices accordingly, and easily underbid the mail contractor for the mail routes between the mainland and the islands.

Flying equipment was a problem. Seaplanes or amphibians were out of the question for frequently the water is too rough; or is filled with floating ice cakes which would crush the pontoons or boat hulls. So the line had to depend on land planes. It bought single-engined land planes of great load capacity, then started airports on Kelley's, South Bass, Middle Bass, North Bass, and Port Clinton. The business grew rapidly, until the line had to get bigger planes, its present tri-motors. Now more passengers daily leave the Port Clinton field than originate at the huge Cleveland airport.

Now the islanders think nothing of going to the mainland, even in the dead of winter, spending a day shopping in the city, and then returning home the same evening—by airplane, of course.

The planes get all kinds of jobs.

When an islander dies, the airline gets business. For there are no undertakers on the islands. "Go to Port Clinton to bring back the undertaker," goes the call to the airline. At the Port Clinton field, a coffin is loaded into the plane—into the open cockpit if one of the New Standards is used, or in the cabin, if one of the tri-motors is used—and the undertaker climbs in. The cargo is flown to the right island.

Sometimes the islander is to be buried somewhere on the mainland—and that means still another job for the airline. For the coffin, containing the dead man, again is loaded into the plane for the jaunt to the mainland where a funeral car awaits.

The line also has helped to build up a couple of profitable businesses for the islanders—the commercial fishing business and the wine business. Famous for their excellent wines, the islands' wineries formerly had to close during the winter because they were unable to ship their product to the market. But not today. They ship by air—and wine serves as an important source of revenue to the line.

One winery on Middle Bass Island, which ships all its wine to consumers by air, employs 11 men as wine packers the year around—and the airline earns more from this business than it does from its mail contract.

Formerly fish were a drug on the market in winter on the islands. Today, they're a valuable commodity, which yields excellent incomes, shipping their catches, carefully packed in chopped ice, to the markets of Cleveland, Columbus, Toledo, and other large mid-western cities.

In winter, when the ice is solid, the ice is often dotted with tiny cabins, just large enough to accommodate one or two fishermen who fish through holes in the ice—and their catches often bring from $10 to $15 a day. Some of the islanders now earn $250 to $300 a month.

The planes and pilots frequently are called upon to aid in saving life and property—so frequently that it has become quite commonplace. Recently, the airport at Put-In-Bay got a telephone call via the underwater cable from Kelley's island:

"Send over a plane, quick."

J. Frank Groat, formerly a pilot for the line and now a pilot for Republic Steel Corporation, took off immediately. Two persons had been hurt seriously in an automobile accident.

The two victims were bundled into the plane, flown to Sandusky airport where an ambulance was waiting and were in the Sandusky hospital within a half hour after the accident—and thus their lives were saved.

Once a coast guard cutter went out in the face of a terrific storm on an errand of mercy and was reported missing, while anxious mothers, wives and children waited.

Groat took off in one of the planes. After an hour's search, he came back and landed. "They're safe," he reported. He had sighted the cutter safe in a sheltered cove at one of the small Canadian islands—and anxious mothers and wives were saved much worry.

Frequently, too, the pilots help to locate the fish boats which sometimes are unable to get back because of storms or ice conditions; other times they help the steamboat concerns or private boat owners by locating the position of ice floes.

Once, three ice-boats piloted by venturesome youths were reported stranded on ice floes which had broken away from the main ice and were drifting out into the open lake. Too near the ice, the iceboat pilots were unable to find their way to safety. But Groat flew out and located the three ice boats, then signalled them he would show them the way to shore. From the air he was able to locate stretches of ice which the boats could cross. Two of the boats finally had to be abandoned and were lost, and one of the iceboat pilots had to swim across a 20 foot crack between the floe and the main pack—but all got ashore safely.

One Christmas, the village of Put-In-Bay was threatened with a shortage of pork—but not for long.

"We'll get you your pork," promised Groat.

A live pig was loaded into the front cockpit of a plane—and that day, the islanders enjoyed their pork.

Frequently, too, the planes are called to haul prisoners from the islands to the courts and jails on the mainland.

Spring is here—but that doesn't mean the end of the season's work for the airline. Ah, no. That's merely the beginning of the busy season.

For the airline is cutting deep into the steamers' business to the islands. Charging only $1 for the trip, the airliners take their passengers between the islands and the mainland in five to 10 minutes—while by boat they must pay 75 cents and spend two to three hours aboard.

END.

That Mean Aerodynamic Chord

(*Continued from page 67*)

loading of the wings as follows. Calculate the following ratios:

$$\frac{t_L}{G} = \frac{\text{thickness of lower wing}}{\text{gap}}$$

$$\frac{s}{C_L} = \frac{\text{stagger at } \frac{1}{3} \text{ chord points}}{\text{m.a.c. of lower wing}}$$

$$\frac{G}{C_L} = \frac{\text{gap}}{\text{m.a.c. of lower wing}}$$

$$\frac{b_u - b_L}{\text{b larger}} = \text{overhang ratio}$$

$$\text{Average aspect ratio} = \tfrac{1}{2}\left[\frac{b_u^2}{S_u} + \frac{b_L^2}{S_L}\right]$$

$$\frac{C_L}{C_u} = \frac{\text{m.a.c. of lower wing}}{\text{m.a.c. of upper wing}}$$

Using the above ratios determine the following:

A_1 from table 1.

B_1 from table 2.

C_1 from table 3.

$$K_1 = \left[(1 - \frac{b_u - b_L}{\text{b larger}})(A_1 + B_1{}^{\delta}) + C_1\right]\frac{C_L}{C_u}$$

$$A_2 = .050 + .17\,\frac{S}{C_L}$$

$B_2 = .0186$ (constant).

F_2 from table 4.

$(A_2F_2 + B_2{}^{\delta})$

C_2 from table 5.

$$K_2 = (A_2F_2 + B_2{}^{\delta} + C_2)\frac{C_L}{C_u}$$

Then, for any lift coefficient,

$$e = \frac{C_{Lu}}{C_{LL}} = \frac{(1+K_2)C_L + K_1}{(1 - K_2 \times \frac{S_u}{S_L})C_L - K_1 \times \frac{S_u}{S_L}}$$

Since the m.a.c. is to be calculated for $C_L = 1.0$, then

$$e = \frac{1 + K_2 + K_1}{\frac{S_u}{S_L}(\frac{S_L}{S_u} - K_2 - K_1)}$$

$$\text{m.a.c.} = \frac{eC_uS_u + C_LS_L}{eS_u + S_L}$$

$$g = G \times \frac{eS_u}{eS_u + S_L}$$

$$O = a\left(\frac{g}{G}\right)$$

TABLE 1

$\frac{t_L}{G}$	$\frac{s}{C_L}$	A_1
.04	1.0	0
.06	1.0	.002
.08	1.0	.007
.10	1.0	.012
.12	1.0	.021
.14	1.0	.033
.16	1.0	.052
.18	1.0	.080
.20	1.0	.122
.04	.5	−.002
.06	.5	−.002
.08	.5	−.002
.10	.5	−.002
.12	.5	−.002
.14	.5	−.001
.16	.5	.003
.18	.5	.011
.20	.5	.025
.04	0	−.002
.06	0	−.005
.08	0	−.010
.10	0	−.018
.12	0	−.025
.14	0	−.034
.16	0	−.046
.18	0	−.058
.20	0	−.073

TABLE 2

$\frac{b_u - b_L}{\text{b larger}}$	C_1
−.20	.04
.00	.00
.20	−.021
.25	−.0214
.40	−.024
.60	−.017
.80	−.009

TABLE 3

$\frac{G}{C_L}$	B_1
.60	−.0720
.80	−.0665
1.00	−.0632
1.20	−.0612
1.40	−.0600
1.60	−.0592
1.80	−.0585
2.00	−.0580

TABLE 4

$\frac{G}{C_L}$	Average aspect ratio	F_2
.60	5	1.85
.80	5	1.54
1.00	5	1.25
1.20	5	1.02
1.40	5	1.00
1.60	5	.83
1.80	5	.68
2.00	5	.57
.60	6	1.47
.80	6	1.22
1.00	6	1.00
1.20	6	.85
1.40	6	.74
1.60	6	.64
1.80	6	.55
2.00	6	.48
.60	7	1.18
.80	7	1.00
1.00	7	.85
1.20	7	.74
1.40	7	.64
1.60	7	.56
1.80	7	.49
2.00	7	.44
.60	8	.99
.80	8	.85
1.00	8	.73
1.20	8	.64
1.40	8	.56
1.60	8	.48

(*Continued on page 90*)

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That Mean Aerodynamic Chord

(*Continued from page* 89)

TABLE 5

$\frac{b_u - b_L}{b \text{ larger}}$	$A_2F_2+B_2\delta$	C_2
−.20	0	−.12
0.00	0	0.00
.20	0	.085
.40	0	.12
.60	0	.07
−.20	.04	−.135
0.00	.04	0.00
.20	.04	.073
.40	.04	.104
.60	.04	.050
−.20	.08	−.092
0.00	.08	0.00
.20	.08	.054
.40	.08	.078
.60	.08	.029
−.20	.12	−.082
0.00	.12	0.00
.20	.12	.054
.40	.12	.070
.60	.12	0.00
−.20	.16	−.072
0.00	.16	0.00
.20	.16	.045
.40	.16	.053
.60	.16	−.030

Determine the location of the leading edge of the m.a.c. relative to the leading edge of the lower wing (L.E.L.W.) as follows:

$h = O - h_L$

$V = g + V_L$

Now let us substitute the figures and areas of a hypothetical ship into these formulas and see what we have. The important areas and figures are as follows:

Span upper wing 28 ft.
Span lower wing 22 ft.
Area upper wing 100 sq. ft.
Area lower wing 60 sq. ft.
Chord upper wing 3.66 ft.
Chord lower wing 3 ft.
Airfoil N.A.C.A. 23012
Thickness lower wing .359 ft.
Gap 3 ft. (this is measured from the m.a.c. of upper wing to m.a.c. lower wing)
m.a.c. upper wing 3.66 ft. (from aerodynamic characteristic of airfoil)
m.a.c. lower wing 3 ft.
Stagger (s) at ⅓ chord point, 1 ft.

$\frac{t_L}{G} = \frac{.359}{3} = .12$

$\frac{s}{C_L} = \frac{1}{3} = .33$

$\frac{G}{C_L} = \frac{3}{3} = 1$

$\frac{28-22}{28} = .214$ (overhang ratio)

Average aspect ratio $= \frac{1}{2}\left[\frac{(28)^2}{100} + \frac{(22)^2}{60}\right]$

$= \frac{1}{2}\left[\frac{784}{100} + \frac{484}{60}\right] = \frac{1}{2}\left[7.84 + 8.06\right] = 7.95$

$\frac{C_L}{C_u} = \frac{3}{3.66} = .819$

$A_1 = -.1$ (from table 1)

$B_1 = -.0632$ (from table 2)

$C_1 = .026$ (from table 3)

$K_1 = \left[1 - \frac{b_u - b_L}{b \text{ larger}}(A_1 + B_1\delta) + C_1\right]\frac{C_L}{C_u}$

δ is the symbol for decalage and is considered positive when the zero lift chords of the upper and lower wings converge ahead of the wings. As our ship has the same amount of incidence in both wings this symbol can be ignored.

So we have:

$K_1 = \left[1 - .214(-.01 - .0632) - .026\right].819 = .784$

$A_2 = .050 + .17 + .33 = .1061$

$B_2 = .0186$ (constant)

$F_2 = .75$ (from table 4)

$A_2F_2 + B_2\delta = .1061 \times .75 + .0186 = .0981$

$C_2 = .062$ (from table 5)

$K_2 = (.1061 \times .75 + .0186 + .062).819 = .1312$

As the m.a.c. is to be calculated for $C_L = 1.0$ then,

$e = \frac{1 + .1312 + .784}{\frac{100}{60}\left(\frac{60}{100} - .1312 - .784\right)} = \frac{1.9152}{-.5043} = -3.79$

$\text{m.a.c.} = \frac{-3.79 \times 3.66 \times 100 + 3 \times 60}{-3.79 \times 100 + 60} = \frac{1567}{439} = 3.56$ ft.

$g = 3 \times \frac{-3.79 \times 100}{-3.79 \times 100 + 60} = 2.589$ ft. or 31 inches.

$O = 1\left(\frac{2.589}{3}\right) = .863$ ft. or 10.35 inches.

$h = 10.35 - O = 10.35$ inches.

$V = 31 + 2 = 33$ inches. The 2 inches here is the vertical displacement of the m.a.c. of the lower wing due to dihedral. If the upper wing has dihedral too then we would have to make the necessary corrections there too.

Locate the C.G. in the proper relation to the m.a.c. disregarding the chords of the upper and lower wings.

END

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Stratosphere

(*Continued from page* 56)

Even with the low humidity of the cabin air, considerable difficulty has been encountered with frost forming on the windows of the pilot's and passenger compartments. The first attempt to overcome this difficulty was to pass all the incoming air over the windows but this was not very successful. Putting additional heat in the air did not help materially and the most successful means tried so far has been the use of small auto windshield fans. Each fan would keep a portion of the glass clear.

Taking ice off the outside of the windows is a problem that has not been solved satisfactorily. On the XC-35 airplane it was found necessary to make one of the windshield panels removable and scrape the ice off. This, of course, is impossible with the cabin under pressure and it is necessary to descend to an altitude where the pressure can be equalized. The windshield panels in the XC-35 airplane are of three-quarter inch laminated glass in order to stand the pressure and this makes it impossible to apply enough heat on the inside to melt ice on the outside .

Several times during flight tests there has been trouble with the malfunctioning of flight instruments such as the airspeed meter and rate-of-climb indicator, and also other instruments affected by pressure. Instrument case leakage was the cause of the trouble and it will be necessary to improve the instrument cases so that they will operate satisfactorily with cabin pressure up to approximately ten pounds per square inch.

Another difficulty which presented itself during the testing of the XC-35 airplane at high altitude was the sluggishness in operation of certain hydraulic mechanisms which operated on engine oil pressure. Propellers and supercharger governors were particularly affected by the cold temperature. Where the flow of oil is intermittent or slow, it freezes. It may be necessary to provide a continuous flow of hot oil or heat the lines and parts affected.

The XC-35 airplane is equipped with an emergency oxygen supply which automatically floods the cabin with oxygen in event the cabin pressure goes below a safe minimum through the cabin system, or in case of supercharger failure. To date this emergency oxygen has not been used but is a safety feature which should be retained for some time or at least until the absolute limits of the whole airplane design are determined.

As a whole, the outcome of the XC-35 supercharged cabin project has been satisfactory and has proven the feasibility of supercharged cabin operation. Numerous technical difficulties were anticipated and, as pointed out above, several were encountered, but none of them should be insurmountable and it is merely a matter of time and normal development before entirely satisfactory installations are in operation.

Summarizing the main problem and lines along which development should take place before pressure cabin operation is entirely satisfactory, they are:

(1) Development of mechanically driven cabin superchargers.
(2) Development of automatic cabin pressure and air flow controls.
(3) Improvement of air system for running flight instruments and de-icers.
(4) Development of satisfactory means for preventing or eliminating ice on windows.
(5) Improvement of instrument cases to stand cabin pressure.
(6) Improvement of hydraulic systems so that they will operate satisfactorily under very cold temperatures.
(7) Continued improvement in structural and mechanical details.

END

Air Corps School

(*Continued from page* 48)

under the command of Colonel Gerald C. Brant.

For some time the expansion of the Air Corps Technical School has been planned in order to meet the increasing demand for Air Corps specialists and craftsmen, due to the greater complexity and large numbers of modern military aircraft which the Air Corps is now receiving.

In planning the expansion of the facilities for training Air Corps technical personnel, both officer and enlisted, it was found advisable to establish this auxiliary branch school at Lowry Field, located six miles southeast of Denver, Colorado. The instruction for photographers and armorers heretofore accomplished at Chanute Field, will, hereafter, be done at this new branch.

The Secretary of War has also announced the inauguration of a new brief course for the training of Army Air Corps pilots on autogiros at Patterson Field, Fairfield, Ohio.

The class of six officers which will begin instruction at Patterson Field in autogiro flying will be under the supervision of Lieutenant-Colonel Junius H. Houghton and the instructors will be 1st Lieutenant H. F. Gregory and 2nd Lieutenants E. S. Nichols and G. H. Snyder.

The course is of six weeks' duration. A second class of six students will take the course immediately following graduation of the first class. The Army Air Corps has been experimenting with autogiros for several months, and as a result of tests with the experimental article delivered to the Air Corps on December 26, 1937, an order was placed for six additional autogiros with the Kellett Autogiro Corporation, Philadelphia, Pa., three of which will be delivered at Patterson Field by that company on May 16th.

END

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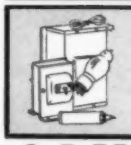

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Why They Jump

(*Continued from page 24*)

But luck was with Bennett. He landed on a housetop in Beaumont Avenue, Kew; a perfect landing in the middle of the roof, which he clutched mightily till he could get his bearings. Taking stock, he discovered that he was all safe and sound. He was uninjured and had been extremely lucky. His only loss was one of his boots which he had kicked off on the way down because it had persisted in burning after he had left the plane.

As Bennett sat there the street below became jammed with people, giving each other advice as to how the pilot could be gotten down from his precarious perch. But he needed no help. He edged his way to a chimney pot, steadied himself for a moment, carefully sat down on the ridge of the roof, gathered up the canopy of his parachute, tucked it under his arm and cautiously slid down the roof to a drain pipe. Peering over the edge he found that the pipe went down close to a bedroom window, so he carefully worked his way down to the window, found it open, entered, found the hall and walked down stairs to the street.

"Where's the old bus?" was Bennett's first question. The "old bus" had descended like a firey comet and hurled itself into the ground in Kew Gardens where thousands of people were taking the air. It missed all of them, including those who sat on a park bench not 15 feet away. Bennett got to the plane in time to see the last of it burn. As he did so someone pushed his way through the crowd and returned to him the scorched boot he had kicked off.

Fog, as the figures show, is one of the greatest bugbears of the flying man. About midnight on September 8, 1935, Flying Cadet Willis S. Marvin of the 96th Bombardment Squadron, approached Langley Field, Virginia. Weather had been reported good by radio when he left Pittsburgh, but when he approached Langley with the big bomber and three passengers, the ceiling was zero-zero. Other fields were tried with the same result. It was fog right down to the ground. As a last resort Marvin ordered his three passengers to jump. Frank B. Connor, crew chief; Sergeant Johns and Private Murdock instantly went over the side and Marvin followed them.

"The fog was so thick," said Marvin later, "that I could only see the risers of my parachute. No canopy at all. I felt like the man on the flying trapeze. But I made a three-point landing. Connor had the worst experience. He fell through a tree and landed in water up to his neck. Then he climbed the tree and sat on a limb until daylight. The plane crashed and burned. The location turned out to be the Pomunkey River, Hanover County, Va."

Fog, snow and ice have played a great part in the heroism of air mail pilots. A whole book of thrills and adventure could be written about the chances they have taken with weather in order to get the mail through. Usually they have succeeded in completing their runs, but at times, after stiff battles with the elements, they have been forced to jump.

END

Loening

(*Continued from page 21*)

engineer of the Sturtevant Aeroplane Company of Boston and it was while with this concern that he introduced steel construction into the American aircraft industry. The planes which he designed for the Sturtevant organization incorporated a fuselage of triangular cross-section built about a steel frame. The radiator of the ship was mounted in the upper center section so as to form a part of the nosing of that section. This was a new practice for that day. The entire empennage of the bus was a steel structure, the members of which were made of channel section galvanized iron lightened by punching and strengthened by crimping. Although these craft were a bit odd looking, they were rather efficient.

In 1917 the young engineer left Sturtevant to organize his own company, the Loening Aeronautical Engineering Corporation. (This concern was later merged with the Keystone Aircraft Corporation.) During this year Loening completed the development of the famous Loening seaplane and at the same time he served the government as an aviation adviser.

The next year he brought out the Loening Fighter, a high-wing monoplane which was rated as the fastest and most practical two-place fighter built during the war. In designing this ship for the Army, Loening paid close attention to speed, armament, and maneuverability. Provided with a transparent section, the pilot's cockpit was so located that he could see both above and below the wings on both sides. The observer's pit was so located that he had an almost unrestricted field of fire, having only the arc of the propeller to be concerned about. The fuselage of this strut-braced monoplane job was very narrow, a fact which allowed the pilot almost unhindered vision forward, while at the same time it increased the field of the observer's guns. The fuselage was also rather deep, thus allowing adequate room for an abundance of equipment. As has been noted, the sides of the pilot's cockpit were covered with a transparent section, thus enabling both the pilot and observer-gunner to see forward and downward. The weight of the Loening Fighter was around 2,368 pounds with a full military load. With its 300 h.p. Hispano-Suiza engine it had a top speed of 146 m.p.h. and it could climb to its service ceiling of 24,000 feet with a full load in 43 minutes. The pilot of this craft was provided with two guns synchronized to fire forward through the propeller arc, while the man in the rear pit had two moveable Lewis guns. For his work in developing this ship, Loening was given the Distinguished Service Medal.

Immediately after the War, Loening began the development of his amphibian design. In 1921 he was awarded the Wright Trophy for his outstanding work and the following year he received the Collier Trophy.

The development of the amphibian probably holds more interest for American aviation fans than any other of Loening's achievements. Although many amphibians had been built up to this time, it remained for Loening to evolve the first *practical*

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amphibian design. By departing for the previous practice of simply adding a folding landing gear to a seaplane or flying boat, he was able to bring out an original development which had flying qualities equal to those of both land planes and seaplanes in the same type class. Essentially, the Loening design consisted in converting a tractor airplane into a flying boat by inverting the engine and building the fuselage as a boat-hull. By using the inverted power plant the pilot was afforded greater and better visibility without interfering in any way with the fore part of the hull.

The first Loening amphibian was powered with the inverted Liberty 12 which had been developed by the Army Air Corps. A two-place job fitted with a four-blade propeller, it was an instant success. Many of these early Loenings were delivered to both the Army and the Navy and several of the Navy's Loenings were used with great success with the MacMillian Arctic Expedition of 1924-25.

By 1926 the design of the amphibian had been much improved and the ships appeared with three-blade steel propellers. These improved craft were tested and passed upon by the Army and several of them were used to make the Army's famous Pan-American Good Will Flight. This trip around South America totaled more than 22,065 miles and it gave full and final proof of the dependability of the Loening amphibian design.

The next year the design was again improved and the ships were available with either the Wright *Tornado* or the Packard 2A-1500. These amphibians too saw active service with the Army and Navy, but in time they too gave way to more advanced models powered with the air-cooled Pratt & Whitney *Wasp*. These jobs were given the acid test when they were successfully used to make the Navy's Alaskan survey.

In addition to the ships already mentioned, Loening brought out a number of other interesting types, including the *Commuter* and the *Air Yacht*. The *Commuter*, a four-place commercial amphibian job was powered with a Wright *Whirlwind*. It met with much success, being used by a number of commercial operators. The *Air Yacht* was an eight-place commercial ship powered with the Wright *Cyclone*.

From the time that the first amphibian left the production line at the Loening factory, almost the entire output was contracted for by the Navy and in recognition of his ability as a designer Loening was made one of the Navy's consulting engineers. In that capacity he designed several interesting planes, among which were the XSL-1, the M-2, and the XS2L-1.

The M-2 was a tiny twin float tractor monoplane type seaplane weighing but 500 pounds. Powered with its 60 h.p. Lawrence engine it had a top speed of 100 m.p.h.

The XSL-1, a diminutive amphibian with a flying boat type hull was powered with a 110 h.p. air-cooled Warner engine mounted as a pusher a short distance above the wing. It had a top speed of 110 m.p.h. Designed to be quickly stowed away aboard a submarine, its construction was so simple that it could be quickly assembled for flight on the confined deck of an undersea craft. This was the only amphibian ever to operate from the deck of a submarine.

The XS2L-1 was a two-place tractor biplane amphibian developed especially for the Navy. Facts and figures have never been released on it.

In 1928 Loening sold his interests to the Keystone Aircraft corporation and he became a consulting engineer for Curtiss-Wright. Leaving Curtiss-Wright the next year, he organized the Grover Loening Aircraft Company.

Although Loening for the most part supplied the Army and Navy with amphibians for observation purposes, he also furnished the Navy with many seaplane and flying boat types. In all, he supplied the Navy with more than 16 different types and models, including special jobs for scouting, patrol, and photography uses.

Among the last ships to be built by Loening were the *Duckling* and the *Monoduck*. The *Duckling* was a small two-place monoplane amphibian designed for the private flyer. Its Warner *Scarab* of 110 h.p. was mounted as a pusher just above the wing. In general design this ship resembled the XSL-1 submarine plane.

Similar to the *Duckling* was the *Monoduck*. An enclosed cockpit job, this monoplane pusher amphibian had a true flying boat type hull. It was powered with a Wright *Whirlwind* engine and the wings were equipped with split flaps to aid in reducing the landing speed.

About two years ago Loening retired from the manufacturing field to do aerodynamic research.

Throughout his career he has been a prolific writer. In addition to writing a vast number of magazine articles he has turned out four books—*Military Aeroplanes, The Revival of the Monoplane, Monoplanes and Biplanes,* and *Our Wings Grow Faster.* The first named book was used as a text book during the World War for the training of pilots by the United States, British, and Canadian governments, for whose use it was officially adopted. So much in demand was this book that it went into nine editions.

Being a smart business man, as well as an excellent engineer, Loening helped to found and was one of the first presidents of the Aeronautical Chamber of Commerce of America and today he is a director of a number of large aeronautic and financial organizations including Roosevelt Field Inc., the Palmer Securities Corporation, and the W. A. Harriman Securities Corporation.

No small social figure, Loening is member of several "high hat" clubs, including the New York Yacht Club, the Meadowbrook Club, the Long Island Aviation Country Club, and the Army and Navy Club (of Washington, D. C.).

This man, whose degrees and honors are many (B.Sc., M.A., C.E., F.R.Ae.S., and F.I.A.S.), is noted for his frankness. He is particularly outspoken concerning aircraft production in this country during the World War. He has only scorn for those who were responsible for the fact that although some $640,000,000 was spent by the United States on aircraft production only 213 ships were delivered in Europe.

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Air Board

(*Continued from page* 50)

One plan is to have all inter-state flying regulated by the Federal Government, and all intra-state flying regulated by the States. This would lead to the horrors of duplication of tests and licenses and would be highly undesirable.

Another plan would be to have the States insist on licensing, but delegate duties to the Federal Government. This, however, is unconstitutional. States cannot delegate their authority to a foreign power, and in matters of the law the Federal Government is a foreign power to a sovereign State. (This was something worth learning!)

Another suggestion was that all States should pass uniform laws for the regulation of flying. But while this would lead to uniformity it would not avoid duplication of authority with its attendant troubles for the airman.

Perhaps the most practical suggestion is to allow the Federal Government to preempt all rights over the regulation of inter-state flying, and to extend very broadly the scope of inter-state flying regulation. A man might leave Floyd Bennett to fly to Roosevelt Field, Long Island, and yet endanger the departure of a chartered airplane bound for Texas.

The Board could come to no resolution. The consensus of opinion was that forthcoming legislation should face the issue squarely, and that some plan should be devised whereby licensing might be universal, yet avoid all conflict between Federal and State authorities, and above all, avoid duplication of regulations. This difficult topic may be the subject of further study by the Board.

END

Airy Chat

(*Continued from page* 9)

individual has already drained the old sock for the plane and for the various gadgets that go along with it.

So, as first aid to the proud owners of a new lightplane, we are publishing a mighty useful and constructive article on the construction of a low-price yet satisfactory and stable hangar. About 100 berries will build this job, and it can be built for still less if the cooperation of old fence and barn owners can be had. It only takes a short fence or part of a small barn to build this airplane stable.

* * *

THERE is one thing that gets me and that is the lightplane engine situation in Europe as compared with that in the United States. In this country, young hopeful builds his plane with the exception of an engine, even a second-hand engine, after he completes his ship.

Over in Europe, there appears to be more lightplane engine builders than lightplane constructors, and therefore I wonder where all the European lightplane engines go. It would seem profitable to both parties if an international clearing house could be set up whereby American lightplanes could be exchanged for European lightplane engines, or words to that effect. In France alone, there are about twenty different makes and models of very fine lightplane engines but apparently nothing much is being done with them in a practical way.

* * *

ARE the present large airplane plants to be considered as belonging to the aviation industry or are they really munitions plants supported in the great part by the sale of military planes? True, they turn out an occasional passenger airliner, but is this a sufficient proportion of the whole output to erase the munition appellation?

* * *

IT is quite interesting to note that the railroads are still holding on to the old faithful steam locomotive and that but relatively few Diesel powered trains are being constructed for mainline express service. They have dolled up the old steam loco with a fancy streamline casing, but beneath the casing is the steady staunch old steam engine that has held its own in battles against electricity as well as fuel oil.

I can only wonder whether this will not ultimately become the situation in commercial aviation. The use of a reliable and efficient steam engine to take the place of the proposed Diesels. Aviation Diesels have not proved satisfactory in the past and there seems to be little hope for the future from this group of prime movers. Then, why don't some large corporation take up the development of aviation steam engines instead of allowing the burden of experimentation being allowed to rest on the shoulders of the small experimenter.

So long—'till next month.—J. B. R.

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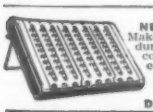

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NC-4

(Continued from page 53)

were truly colossal even when compared with present day wings. They were of all-wood construction and were capable of carrying 11.7 pounds per square foot while the structural weight of the wings was only 1.5 pound per square foot.

While the ribs weighed only 26 ounces, they were capable of carrying a load of 450 pounds for 24 hours without showing signs of weakness. The wings were of the spruce box spar type and the leading edges of the wings were hinged so that they could be raised for the inspection of the control cables within the wing.

So carefully were the stability factors adjusted, it was found that the NC ships were practically self-flying and were capable of continuing on their courses with but little attention from the pilot. Prior to the construction of these 14-ton flying boats it was doubted whether they could be handled by one pilot, but the careful balancing of the controls made it possible for one man to handle the craft without difficulty.

Another point of interest on the NC boats is the hull. This member has a length of 44'-8" and a beam or width of 10'-0", giving plenty of space for the crew, fuel and the spare parts.

Five bulkheads divide the hull into six water-tight compartments and assist in stiffening the structure. The first forward compartment contains a cockpit for the lookout and navigator. The second compartment is a side by side seating for the pilot and co-pilot (known in 1919 as the "assistant aviator").

Third is the compartment for the members of the crew off watch for resting or sleeping and following this compartment is the space occupied by the gasoline storage tanks. In the fifth compartment is the radio equipment.

The hull of the NC's is a remarkable construction from a structural standpoint for the hull weighs only 2,800 pounds and yet is capable of floating 28,000 pounds—10 to one. The bottom is a double plank "Vee" with a single step while the bow is an easy flaring type so that the boat can be driven through a heavy seaway up to the take-off speed. The planking of the hull consists of a layer of muslin set in marine glue between two layers of spruce.

Great credit must be given to Rear Admiral Taylor and to Commander Westervelt for their originality and sound sense in the construction of these huge boats. They were far larger than any ship placed into long distance service up to that time and this called for inventiveness as well as simple engineering sense.

Again, the problems of navigating the NC-4, the first ship to span the ocean, was a matter of long and deep consideration by the navigators and meteorologists for they were attempting something that had never before been accomplished. END

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Forced Landings Can Be Funny

(*Continued from page* 61)

from, how I got there or a damned thing!"

The Lieutenant sighed.

"It was tough for a long time after that," he said. "The Colonel's feelings were really hurt. . .

"And it didn't help any when he learned that I had found a Department emergency field not too far away."

* * *

The Kansas farmer was wise and the Arizona sheepherder didn't give a damn but Frank Clarke's forced landing hosts were proud.

Frank was heading for an air meet in Chicago when his motor quit somewhere over Missouri. He swung wide for a look and sighted a farm with half a dozen people in the fields. Here was help ready at hand. He went ahead about a quarter of a mile, turned and came on in close to the homestead.

Clarke loosened his safety belt and stood up in the cockpit to welcome the farm folk as they came toward the plane. Then he raised his goggles and looked again.

There wasn't a soul in sight!

Frank felt a little ticklish. Where had they all gone—and why? He'd heard tales of how Missourians in some districts look upon strangers as possible "revenooers" and shoot on sight. . . .

Then he felt silly.

Out of the farm house trooped the whole family and the hired hands—quickly changed from top to toe into their Sunday-go-to-meetin' clothes!

* * *

Mac operated, among other ships, a *Cub* on floats before he was appointed a Department of Commerce inspector. Since his appointment he has been somewhat reticent about this adventure so "Mac" is name enough—especially since we have a renewal coming up. . .

The seaplane ramp is right on the edge of the landing field, with a little dock and float at one side. One of the airline pilots whose run terminated at the field decided to try his hand in the little seaplane.

"Now don't take any foolish chances," Mac cautioned. And walked right into the water.

Mac went around with him a few times. On the first round the airline man absently cut the gun and headed for the land runway. Mac chided him lightly and sent him toward the water.

The second time around was perfect but on the third the pilot again started for the runway, then caught himself without Mac's cautioning.

They taxied up to the dock and Mac stepped out on one float, pausing for a last word of warning.

"Remember," he said, "you're in a seaplane. I used to forget once in a while—but I've got over it now. . ."

So saying, Mac turned and. . .

Stepped off the Edo into five feet of dirty salt water!

END

Phantom Lake

(*Continued from page* 48)

and it is from the largest of these that the water flows. The largest of the holes is about 25 feet deep and has been explored for a quarter of a mile from its mouth. A stream which never runs dry can be seen from several of the openings.

No streams pass near the territory where the Phantom Lake forms. It is the general belief of those who have made an examination of the "sink holes" that the limestone caverns become filled with water and the surplus comes to the surface. When the water drains out of the caverns, the lake recedes through the same openings from which it came.

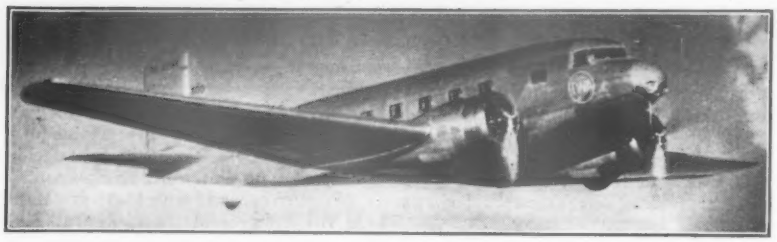
At this season of the year, local pilots, who use the field frequently, always "look before they land" because the lake appears suddenly and without warning. Field authorities are contacted every day by residents living near the largest hole and curious visitors throng to the spot on Sundays to hear the latest news.

Many flights were made from the Bellefonte field two years ago when the Phantom Lake was at its greatest, but these flights were made entirely by ducks, geese, brant and other waterfowl which stopped over on their flight north.

Imagine yourself flying blind on one of the legs of the Bellefonte beam and, on coming out underneath, finding a seadrome instead of an airport on which to land. A number of passing ships are reported to have dipped over the field to learn of the strange sight, but records show no ship was ever in distress over Centre County when the field was covered with water.

Will the Bellefonte field be turned into a marine base this spring? That is a question which can't be determined until later in the summer. However, pilots flying over the Hell Stretch will be notified of the fact should the Phantom Lake suddenly put in its appearance.

END



Can you answer these questions?

The compass reading is 230°, the variation is 18° E, the deviation is 7° W. Determine the true heading.

What would you do to get a plane out of a tail-spin?

What is the purpose of a condenser in the ignition system?

How is the torque of the propeller balanced in rigging a plane? Why is the vertical fin sometimes slightly offset?

What are 8 significant landmarks that are shown on good avigation maps which may be identified easily from the air?

What is the effect of having an adjustable stabilizer too high when landing?

What are the four basic cloud forms? What is the approximate altitude at which they occur? What flying conditions do they indicate?

In flying out of a small field, is a small or large propeller pitch desirable?

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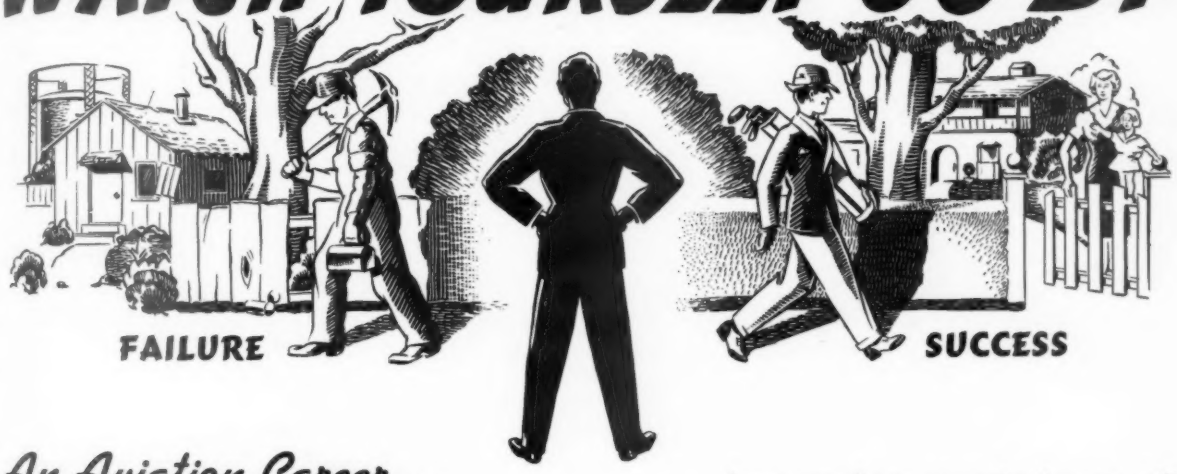

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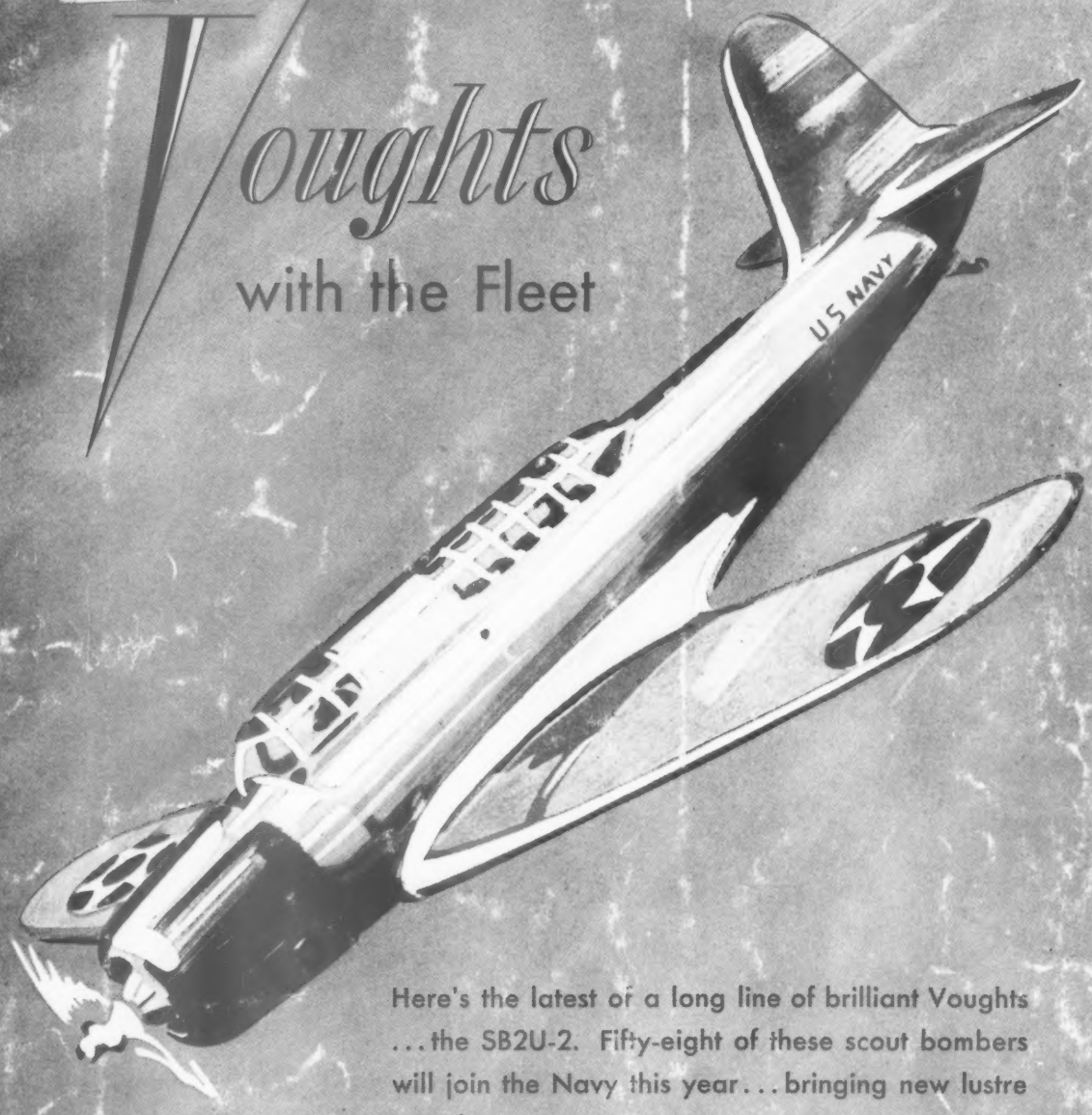

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